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(Continued on Inside Back Cover)

THE JOURNAL OF
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A FACTOR ANALYSIS OF APTITUDE AND ACHIEVEMENT ENTRANCE TESTS AND COURSE GRADES AT THE UNITED STATES COAST GUARD ACADEMY

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INTRODUCTION

Beginning in 1942, the psychological program at the United States Coast Guard Academy first worked on methods for selecting Reserve Officer candidates.[2,5] In 1943, research on the development of methods for selecting cadets (potential career officers) was initiated.[3,4] This research resulted in the introduction, in 1947, of an entirely new system of annual national competitive procedures. The development of the system is described by Newman and Bobbitt.[6]

Coast Guard cadets must be able to master a difficult four-year collegiate academic course leading to a Bachelor of Science degree in Engineering and a commission as ensign. In addition, cadets are trained in professional naval subjects. Intensive work in physical education is also part of the training. Constant observation is undertaken by Coast Guard officers on the Academy staff, as well as by upperclassmen, to determine if the cadet exhibits the qualities considered essential to officer fitness. Adequate selection methods are needed to obtain the caliber of cadets who can meet Academy requirements. Findings concerning the selection of cadets should be applicable to the solution of problems of selecting individuals for academies and other types of collegiate educational institutions.

A factor analysis of entrance, aptitude and achievement tests and grades was performed to obtain more precise knowledge of the psychological factors or functions involved in the tests and the grade criteria. Such information will add to previous findings concerning factors related to academic success at the Academy. Research has produced tests that adequately predict course grades and academic standings.[2,3,6] The discovery of the psychological factors utilized by cadets in course work would aid the development of selection methods by (a) increasing the probability that good tests of each of the psychological functions would be included in the entrance tests, (b) showing the kinds of tests that could be eliminated from any entrance battery because they were measuring functions not involved, and (c) discovering those factors which entrance tests are not now adequately covering, furnishing leads for the construction of such tests.

PROCEDURE

The factor analysis used twenty-three aptitude and achievement test scores and fourteen course grades obtained for one hundred cadets in the class of 1949. The entrance test scores were chosen to represent a variety of kinds of aptitude and achievement tests, and included the following (variable numbers refer to those in Table 3, the table of loadings on rotated factors):

(a) Three achievement tests used in the national competitive entrance examinations, Mathematics, Objective English, and English Composition (variables number 16, 21, 22).

(b) A very difficult Scholastic Aptitude Test, measuring quantitative and verbal aptitudes, specially constructed by L. L. and T. G. Thurstone on the basis of data furnished by Academy psychologists (variables number 3, 4). This test was used in the national competitive examinations.

(c) A Board adaptability rating, based on interview results and other records, which was part of the national competitive procedure (variable number 23).

(d) Aptitude and achievement tests administered to the class of 1949 as soon as possible after entrance to the Academy during the summer experimental entrance testing program. These include (1) special College Entrance Examination Board (CEEB) aptitude (variables 6, 9, 10, 14) and achievement tests (variables

15, 17, 18, 19, 20); (2) American Council on Education Psychological Examination—L. L. and T. G. Thurstone (variables 1, 2); (3) Stanford Scientific Aptitude Test—D. L. Zyve (variable 5); (4) U. S. Coast Guard Academy Mathematical Reasoning Test (developed at the Academy) (variable number 8); (5) Dynamicube Test of Power to Visualize—C. V. Mann (variable 11); (6) Army Air Force Aviation Cadet Qualifying Examination, Judgment section (variable 7), and Perception of Closure or Gottschaldt Figures section (variable 12); (7) U. S. Navy Officer Classification Test, Mechanical section (variable 13).

Grades awarded during the first year of attendance at the Academy were utilized. These included grades in the following subjects:

(a) Seamanship and Small Arms, preliminary summer term (variables 25, 26).

(b) History and Literature, Physics, Analytical Geometry and Calculus, Engineering Drawing, and Signals, awarded at the end of the first semester (January) (variables 27, 29, 31, 33, 36) and at the end of the second semester (May) (variables 28, 30, 32, 34, 37).

(c) English Composition, end of first semester (variable 35).

(d) Navigation, end of second semester (variable 38).

Four composite measures were used. These included final Entrance Mark (variable 24) and grade term averages for the preliminary summer term (September) (variable 39), end of first semester (January) (variable 40), and end of second semester (May) (variable 41). While the factor loadings of these composite or average measures were computed, the four composites were not permitted to affect the determination of the factors, since they were composed of grades already in the analysis.

Product-moment intercorrelations were computed for all the variables. (The table of intercorrelations has been omitted from the printed article to save space, but may be obtained from the first author.) Nine reference factors were then extracted by a modification of the centroid method of Thurstone[8] worked out for IBM machines by Tucker.[11] No further extraction of factors seemed indicated as the residuals left after these extractions were very small, the highest being .126. (The table of reference factors has also been omitted to save space but is also available from the first author.) The reference factors were

then rotated to simple structure with oblique axes by a semi-analytical and semi-graphical method devised by Tucker.[10]

The high degree of selection to which the class of 1949 was subjected upon entrance to the Academy has to some degree confused the factorial picture. In general, selection tends to decrease the variability of the group. This results in lower correlations and less clearly definable factors. The correlation between variables both of which were used for selection may decrease to such a marked extent as to reach an appreciable negative value. For example, the correlation between the

TABLE 1.—MEANS AND STANDARD DEVIATIONS OF ENTRANCE TESTS ILLUSTRATING THE AMOUNT OF SELECTION

		N = 2253	N = 968	N = 374	N = 128	N = 100
3) SA-Quantitative	M	38.6	42.6	46.2	48.7	48.3
	SD	9.8	9.3	9.0	9.0	9.2
4) SA-Linguistic	M	54.4	64.8	70.1	75.4	75.0
	SD	14.5	12.5	12.2	10.9	10.9
16) Entrance Mathematics	M		68.6	78.3	82.0	82.2
	SD		9.8	6.7	6.8	6.4
16a) Entrance Mathematics	M	27.3	32.2	37.8	39.5	
Objective Part	SD	7.8	6.7	4.9	4.5	
21) Entrance English	M	105.3	124.6	130.2	136.4	136.9
Objective	SD	21.4	13.4	14.6	13.9	13.5
22) Entrance English	M		31.9	33.9	35.1	35.5
Composition	SD		5.0	3.9	4.1	4.0
23) Entrance	M			77.6	80.1	80.4
Adaptability	SD			5.0	4.3	4.3
24) Entrance Mark	M			77.7	80.5	81.0
	SD			3.9	2.9	3.1

SA-Quantitative and the Entrance English Objective scores was .39 for the 2,253 applicants, but had gone down all the way to −.22 for the one hundred cadets used in this study. Fortunately, factor analysis is not very sensitive to this type of distortion of the correlations. Although selection may have decreased some loadings, and even may have led to some change in the factors which were found, it appears that the usefulness of the study has not been seriously hampered.

Table 1 demonstrates the extent of selection by showing the continual increase in mean and decrease in variability of the group at the various stages of the selection process. The intercorrelations in Table 2, computed for each stage in the selection process, show the downward trend of the correlations.

TABLE 2.—EFFECTS PRODUCED BY EACH STAGE OF SELECTION ON SIZES OF INTERCORRELATIONS

1. SA-Quantitative
2. SA-Linguistic
3. Ent. Eng. Objective
4. Ent. Math.
5. Ent. Eng. Composition
6. Ent. Adaptability
7. Entrance Mark
8. Ent. Math. Objective Part

N = 2253

	1	2	3	8
1		50	39	63
2	50		77	57
3	39	77		57
8	63	57	57	

N = 968

	1	2	3	4	5	8
1		38	17	42	08	56
2	38		63	34	29	41
3	17	63		31	35	32
4	42	34	31		23	83
5	08	29	35	23		23
8	56	41	32	83	23	

N = 374

	1	2	3	4	5	6	7	8
1		32	10	23	−07	68	43	53
2	32		69	24	20	58	63	36
3	10	69		23	27	33	63	26
4	23	24	23		13	22	77	61
5	−07	20	27	13		08	39	05
6	68	58	33	22	08		67	43
7	43	63	63	77	39	67		62
8	53	36	26	61	05	43	62	

N = 128

	1	2	3	4	5	6	7	8
1		12	−18	13	−16	60	28	51
2	12		67	04	16	25	48	11
3	−18	67		−05	30	−10	40	01
4	13	04	−05		03	−15	71	57
5	−16	16	30	03		−07	40	−08
6	60	25	−10	−15	−07		31	18
7	28	48	40	71	40	31		52
8	51	11	01	57	−08	18	52	

N = 100

	1	2	3	4	5	6	7
1		12	−22	22	−12	64	36
2	12		69	17	22	26	56
3	−22	69		06	27	−14	41
4	22	17	06		07	−06	74
5	−12	22	27	07		−01	41
6	64	26	−14	−06	−01		38
7	36	56	41	74	41	38	

RESULTS AND DISCUSSION

Table 3 gives the loadings on the rotated factors with communalities (h^2), means (M) and standard deviations (σ) for each variable. The number of very low loadings in the table indicates that a fair simple structure was obtained in the rotation even though the variables are largely complex ones.

The communalities indicate a few variables (7, 25, and 26) whose common factor variance in this study is very low. It is difficult to tell whether these low communalities are brought about by low reliability or by actual unique variance. Most of

TABLE 3.—LOADINGS ON THE ROTATED FACTORS

Variable	I	II	III	IV	V	VI	VII	VIII	IX	h^2	M	σ
1. ACE-Quantitative	*.60*	−.06	.02	.03	.02	.03	.01	.18	*.37*	.68	62.8	7.7
2. ACE-Linguistic	.26	*.60*	.05	−.12	.14	−.08	*.33*	.05	.01	.71	94.6	8.5
3. SA-Quantitative	*.61*	−.06	−.02	−.03	−.06	−.05	.01	*.49*	.29	.84	48.3	9.2
4. SA-Linguistic	.09	*.66*	−.02	.04	−.12	−.08	*.34*	*.32*	.06	.74	75.0	10.9
5. Zyve Scientific Apt.	.01	.03	*.44*	.09	.17	.01	.01	−.12	.27	.48	111.6	21.8
6. CEEB Scientific Apt.	*.44*	.05	.27	.02	.04	.13	−.03	−.06	.23	.55	31.7	5.0
7. AAF Judgment	−.04	−.03	.25	−.12	.21	.00	.03	.08	−.09	.23	18.5	2.5
8. USCGA Math. Reas.	.12	−.05	*.36*	.03	.22	−.01	−.04	.00	*.50*	.54	48.8	8.7
9. CEEB Math Apt.	*.39*	.10	.03	.14	.00	.00	.02	.23	*.52*	.58	38.9	5.4
10. CEEB Spatial	*.52*	.09	−.09	−.04	.04	*.30*	*.43*	−.05	.01	.59	43.8	9.0
11. Dynamicube	*.46*	.00	.03	−.05	.10	.11	.25	.02	.24	.49	111.2	31.3
12. Gottschaldt Figures	.01	.02	*.51*	−.03	−.15	*.45*	−.06	.01	.01	.59	27.1	7.6
13. OCT Mechanical	.08	.01	.05	−.05	−.16	.12	*.53*	−.03	−.08	.57	59.2	10.3
14. CEEB Verbal	−.10	*.79*	*.38*	−.07	.16	.16	.10	.00	−.09	.81	108.6	19.2
15. CEEB Reading	.22	*.41*	−.01	−.04	*.52*	.00	.22	−.02	−.15	.51	44.6	6.1
16. Entrance Math.	.07	−.00	−.02	−.03	−.13	−.11	−.03	−.03	*.65*	.52	82.2	6.4
17. CEEB Math. Achieve.	.13	.02	.18	.01	−.14	.05	−.04	−.07	*.61*	.54	20.2	4.9
18. CEEB Physics	.24	−.07	.20	.14	−.06	−.09	.21	−.02	.07	.63	30.8	6.9
19. CEEB Social Studies	.15	.19	.07	.06	*.47*	−.24	.00	.02	.10	.40	115.0	19.0
20. CEEB English	.28	*.64*	.06	−.06	.08	.26	*.33*	.15	.05	.59	127.8	22.7
21. Ent. Eng. Objective	−.09	*.60*	−.08	.09	−.05	−.02	*.42*	.02	−.02	.69	136.9	13.5
22. Ent. Eng. Comp.	−.19	*.36*	−.09	.01	.28	.08	.27	.24	.07	.39	35.5	4.0
23. Ent. Adaptability	*.39*	.14	−.02	−.03	−.05	.05	.08	*.60*	−.06	.57	80.4	4.3
24. Entrance Mark	.14	*.42*	−.13	−.07	−.08	−.10	.29	*.44*	*.59*	.91	81.0	3.1

Variable	I	II	III	IV	V	VI	VII	VIII	IX	h^2	M	σ
25. Seamanship (Sept.)	.06	.02	.02	−.02	.08	.14	*.32*	−.06	.07	.18	81.4	8.4
26. Small Arms (Sept.)	−.13	.08	.04	.07	−.01	.27	*.40*	.12	−.05	.28	79.2	7.2
27. Hist. & Lit. (Jan.)	−.00	*.50*	.01	*.37*	*.50*	.03	−.12	−.04	−.03	.75	76.0	6.7
28. Hist. & Lit. (May)	.04	*.41*	−.10	*.57*	.16	.11	−.01	−.06	.00	.67	78.0	6.2
29. Physics (Jan.)	−.12	.04	.20	*.63*	.15	.07	.09	.03	*.43*	.75	77.6	8.2
30. Physics (May)	.08	−.07	.16	*.68*	−.03	−.03	−.05	.04	*.40*	.77	76.4	8.1
31. A Geom. & Calc. (Jan.)	−.05	.08	.06	*.66*	−.10	−.00	.05	.12	*.53*	.81	74.8	8.6
32. A. Geom. & Calc. (May)	.06	−.02	.01	*.71*	−.03	−.06	−.03	−.07	*.51*	.81	75.0	9.0
33. Engin. Draw. (Jan.)	.09	.01	−.01	.24	−.07	*.59*	*.56*	−.03	.03	.77	80.6	5.8
34. Engin. Draw. (May)	−.06	−.05	.01	.28	.02	*.59*	*.41*	−.09	−.00	.61	83.8	4.6
35. Eng. Comp. (Jan.)	.01	*.59*	.09	.24	.24	*.41*	.09	.03	.05	.63	81.0	4.9
36. Signals (Jan.)	−.02	.04	−.04	.26	.17	.04	.01	*.33*	*.35*	.42	86.6	9.7
37. Signals (May)	.03	.29	.04	.11	−.06	−.02	−.17	*.47*	.06	.35	85.4	6.1
38. Navigation (May)	.08	.09	.02	*.43*	.05	.13	.08	.13	*.40*	.50	75.2	8.6
39. Term Average (Sept.)	.06	.09	.06	.27	.14	.16	*.36*	.03	*.34*	.52	81.0	5.6
40. Term Average (Jan.)	−.11	.24	.14	*.67*	.28	.17	.06	.00	*.31*	.82	77.0	5.2
41. Term Average (May)	.09	.11	.02	*.81*	.04	.05	−.02	−.01	*.41*	.97	76.4	5.7

the communalities, however, are sufficiently high to indicate that the factors found in this study explain a reasonably good proportion of their non-chance variance.

Interpretation of Factors.—The high loadings for each factor in Table 3 have been printed in italics to facilitate reference to them in the course of the discussion below. Each factor in turn will be interpreted as some function involving the variables in italics, while not involving the other variables in the study.

TABLE 4.—INTERCORRELATIONS OF FACTORS

	I	II	III	IV	V	VI	VII	VIII	IX
I		−.16	.46	.28	−.08	−.10	.17	.00	−.16
II	−.16		−.21	.03	−.16	−.14	−.16	−.30	.12
III	.46	−.21		.22	−.10	−.42	.60	.14	−.28
IV	.28	.03	.22		.03	−.06	.05	−.02	−.12
V	−.08	−.16	−.10	.03		.06	−.07	.16	.00
VI	−.10	−.14	−.42	−.06	.06		−.45	.09	.39
VII	.17	−.16	.60	.05	−.07	−.45		−.01	−.09
VIII	.00	−.30	.14	−.02	.16	.09	−.01		.01
IX	−.16	.12	−.28	−.12	.00	.39	−.09	.01	

It seems most probable that Factor I is a reasoning factor. The high loadings for tests involving arithmetical reasoning, and number series problems, variables 1 and 3, suggest that it is the same factor as that found repeatedly in the Army Air Force analyses and called General Reasoning.[1] The USCGA Mathematics Reasoning test may be pitched at such a high level that variance in mathematics achievement is more important to it than is reasoning. In the CEEB Spatial test and in the Dynamicube test, the most successful procedure is to devise rules or systems of approach that can be applied to successive problems. The reasoning factor found in arithmetic and in number series problems has been called deductive by Thurstone[9] since a background of mathematical theory is applied to new problems. This is in contrast to Inductive tests where the job is to look for a theory and to check hypotheses. We can, then, tentatively call this factor Deductive Reasoning.

Factor II is clearly the Verbal factor which has been found in a number of factor analysis situations. It is characterized by an understanding of word meanings and the relations between words.

Factor III may be another reasoning factor, but the evidence is not clear. It will be best to leave this factor uninterpreted.

Factor IV seems to be something reflected entirely by course grades. For purposes of this study it will be called 'Grade Aptitude.' Since it is highly related to success in courses, it is important to measure it. However, none of the tests used in this analysis have loadings of any significance on this factor. Former studies of grades at the Academy have hinted at the existence of this factor by revealing the high correlations between grades regardless of subject matter.[7] This may well be a factor such as interest in the Coast Guard curriculum, persistence, study habits, or ambition. A factor of this sort might also be a result of a situation where the instructors permit their own grading to be influenced by the grades given by other instructors. The most usual and most unavoidable instance of this occurs when some students acquire a reputation for getting high grades while others gain a reputation for getting low grades. In the Coast Guard situation, however, it seems unlikely that this factor could be halo. Instructors' ratings on coöperation and on conduct were found in another study not to correlate with grades.[7] If the instructors allowed halo to influence the grades, the grades would probably be related to the coöperation and conduct scores which include subjective ratings made by the same instructors.

Factor V appears to be one which characterizes the man who is in the habit of doing much reading and of increasing his general knowledge and culture by so doing. It characterizes the man who likes books or is able to read them easily as distinct from the one who shows merely high verbal aptitude. Perhaps this factor could be named Reading Activity, and Knowledge Gained Through Reading.

Factor VI is evidently the Spatial factor which has shown up in a great many factor analyses. The presence of the English Composition grade among the variables with a high loading on this factor cannot be explained. The Gottschaldt Figures and the College Entrance Examination Board Spatial tests are both tests involving line drawings. Spatial tests such as these have often been shown to be highly related to Engineering Drawing, but ordinarily not closely related to any other grades.

Factor VII appears to contain three different kinds of tests. Two of these are (a) mechanical (U. S. Navy Officer Classification

Test—Mechanical Section) and (b) Spatial (College Entrance Examination Board Spatial Test). These two tests are usually found to be fairly closely related. The third group contains verbal tests (the linguistic portions of the Scholastic Aptitude Test and the American Council on Education Psychological Examination, the Objective English Entrance Test, and the CEEB English Test). The grade components are primarily subjects involving mechanical, spatial, and verbal abilities (Engineering Drawing, Small Arms, and Seamanship). It is interesting to speculate, therefore, that this factor represents the ability to utilize verbalizations in the solution of mechanical-spatial problems or to combine verbal, mechanical, and spatial aptitudes in the solution of problems involving these three aptitudes. It could represent the Mechanical Experience factor found in many of the Army Air Force analyses.[1]

Factor VIII does not represent a real psychological function, but has appeared in this study because Entrance Adaptability scores and Entrance Marks were assigned with reference to scores made on the quantitative and linguistic sections of the Scholastic Aptitude Test. These scores were part of the material used by the Adaptability Board. The presence of the two Signals grades in this group cannot be satisfactorily explained.

Factor IX is a Mathematics factor. Entrance Mark is high up in this group because Entrance Mathematics was heavily weighted in computing it. The Term Averages are found in this list since they are partly composed of Mathematics course grades.

Since the Number factor commonly found in batteries containing number tests does not appear elsewhere in this analysis, it may safely be surmised that number ability is involved in this factor. It is apparent also, however, that the variables with the highest loadings are measures of Mathematics achievement. It is very likely that both Number ability and Mathematics achievement are being represented by this factor.

It is quite possible for two factors to appear as one in some batteries of tests. This can happen when the tests included in the battery contain two factors in similar proportions. Factor IX is a case where it seems likely that Mathematics achievement and Number appear as one factor, because there did not occur in the battery any tests which had a high loading on one of them

and a low loading on the other. A composite factor of this sort serves to describe the variance on a particular group of tests and grades, but would probably not show stability as a single factor in analyses which include purer tests.

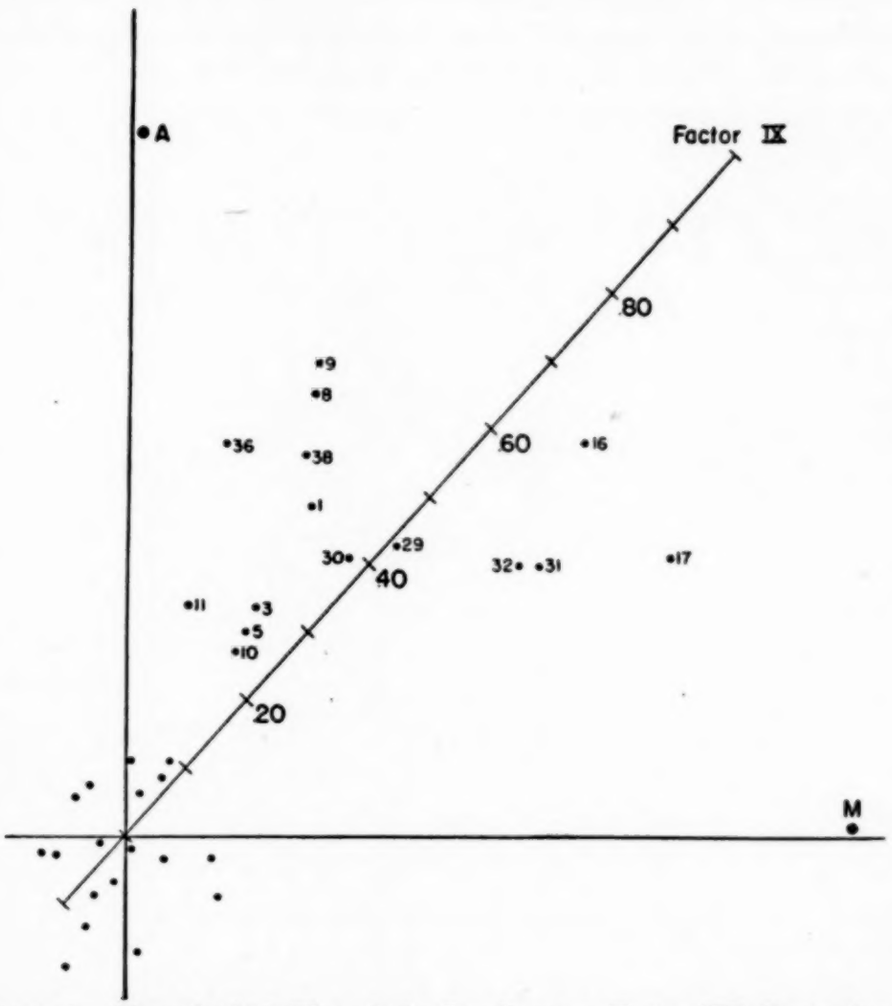

Figure 1. Hypothetical Plot of the Loadings on Factor IX, illustrating the artifactual joining of two factors.

Figure 1 shows a hypothetical plot of the variables in this analysis. The plot shows the actual loadings on Factor IX, but these loadings are spread out on a hypothetical hyper-plane such as might be determined by the addition of a test of Number ability, A, such as addition, and a pure test of Mathematics Achievement, M, consisting, for example, of word-questions about mathematical principles or a measure of the time the student has spent studying mathematics.

Further information about the factors can be had from an

inspection of Table 4 which shows the intercorrelations of factors. These intercorrelations could be subjected to a factor analysis that would yield second-order factors. Inspection of the table indicates that a considerable part of the intercorrelations can be attributed to a second-order factor having a positive relation with factors I, III, and VII, a slight positive relation with IV,

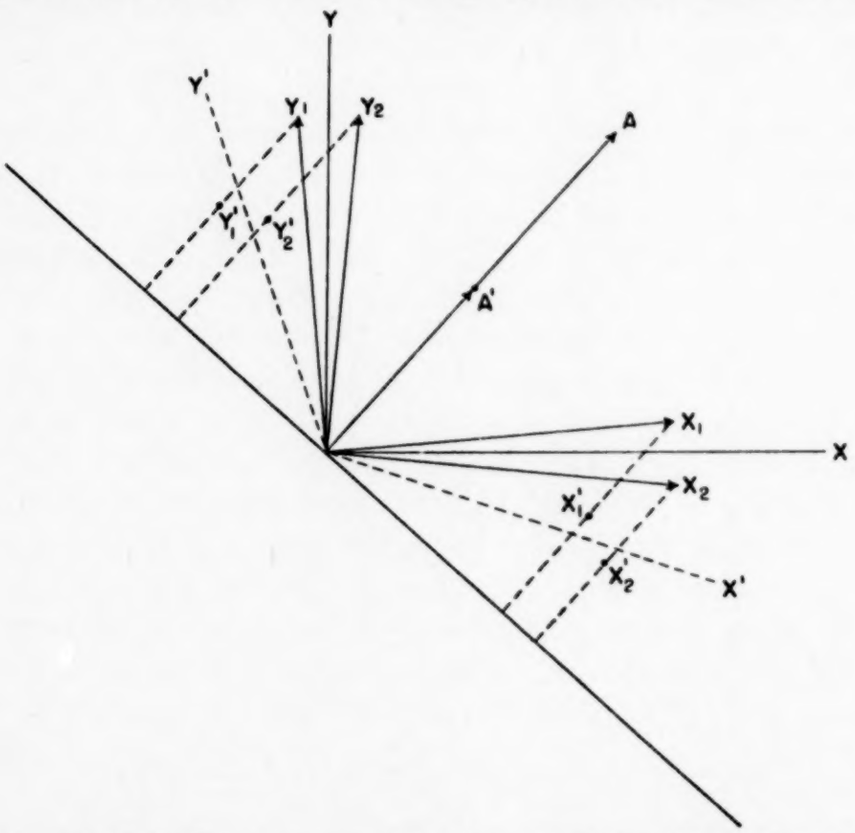

Figure 2. Restriction of range on variable A causes Factors X and Y to become negatively correlated.

and some negative relation with factors VI and IX. It does not seem wise to attempt an interpretation of this second-order factor, since no clear interpretation suggests itself.

The large number of negatively correlated factors is probably a result of the extreme degree of selection in the experimental group. Factors will tend to become negatively correlated when there is restriction of range on a variable lying between them. Figure 2 illustrates this point. Tests X_1 and X_2 determine Factor X and tests Y_1 and Y_2 determine Factor Y. If, however, variance on test A is restricted to A′, the variance in the direction A for tests X_1, X_2, Y_1, and Y_2 will be restricted to X_1', X_2', Y_1' and Y_2' respectively. The factors X′ and Y′, determined by the

new locations of the test vectors, will now have a marked negative correlation as shown.

SUMMARY OF THE FACTORIAL COMPOSITION OF COURSE GRADES

Since the purpose of this study is to find out what psychological functions must be measured in order to predict grades at the Academy, the factorial composition of grades is summarized in Table 5 which gives average loadings where such averages are above .15.

TABLE 5.—SUMMARY OF THE FACTORIAL COMPOSITION OF COURSE GRADES

	Deductive Reasoning	Verbal	Reasoning ?	Grade Aptitude	Reading	Space	Verbalization of Mechanical & Spatial Relationships?	Entrance	Mathematics
	I	II	III	IV	V	VI	VII	VIII	IX
History & Literature		.45		.47	.33				
Physics			.18	.65					.42
Mathematics				.69					.52
Engineering Drawing				.26		.59	.49		
English Composition		.59		.24	.24	.41			
Seamanship							.32		
Small Arms						.27	.40		
Signals		.16		.18				.40	.21
Navigation				.43					.40
The Averages		.15		.58	.15				.35

Aside from the loadings of Factor IV, which has so far eluded measurement by tests, the Mathematics and Verbal factors are most important with Mathematics having a definite edge, as can be seen by the loadings of The Averages. (The Mathematics grades in the Term Averages are more heavily weighted than other grades.) This indicates the general correctness of past methods of weighting tests for admission.[6]

Conspicuous because of their lack of loadings are the two reasoning factors. This appears to be significant evidence that

the differences in reasoning ability within the cadet group as represented by these two factors are not reflected in the grading system, although they may be important in the actual course work. If predicting success in grades is the only consideration, tests of the reasoning factors found here should be omitted from the entrance battery in favor of other kinds of tests. A final decision would have to depend on whether or not differences in reasoning ability bear any relation to different amounts of success among Coast Guard officers after graduation from the Academy. Although the reasoning factors measured by tests used in this study have little effect on grades, it is still possible that other reasoning factors which do affect grades may exist.

The analysis indicates that prediction of academic success at the Academy should be based on tests of mathematical ability, verbal ability, reading, and spatial ability, in that order. It also indicates that it may be possible to develop suitable tests for measuring the unknown factor, Factor IV, which has been termed 'Grade Aptitude.' As suggested earlier, this may be a non-academic type of function. The new Index of Background, Activities, and Preferences, now in the process of being developed at the Academy, may aid in the measurement of this factor.

Now that the results of this factor analysis agree with other studies in indicating the tests which are most appropriate for differentiating grades at the Academy, an interesting further step might be to find out just what scores on the tests are needed to indicate that a man will not fail. Such questions as the following could be answered by a rather simple graphical study: To graduate must a cadet be above a certain level on both Mathematics and Verbal? Must his average on either Mathematics or Verbal be above some level? If he is above a certain level on one ability, can he succeed with a low score in another ability? What are the appropriate cutting scores?

In spite of the relative complexity of the variables and the disturbances in the correlation matrix, it is interesting to note that most of the factors found resemble those discovered in other analyses. Such an instance of factorial invariance speaks well for the simple structure solution of factorial problems.

SUMMARY AND CONCLUSIONS

This study was undertaken to identify the factors or psychological functions responsible for a large part of the variations

in psychological test scores and grades of cadets at the Coast Guard Academy. A factor analysis was performed based on a correlation matrix containing twenty-three test scores and fourteen grades made by one hundred cadets in the class of 1949. The cadets were tested before entering and immediately subsequent to entering the Academy. The grades were obtained during the first year of attendance.

Nine factors were discovered. These have been termed: I—Deductive Reasoning; II—Verbal; III—Another Reasoning factor; IV—'Grade Aptitude'; V—Reading Activity and Knowledge Gained Through Reading; VI—Spatial; VII—Indefinite, possibly verbalization in mechanical-spatial problem solving or Mechanical Experience; VIII—Entrance Scores, produced by the method of assigning entrance grades; IX—Mathematical.

Analysis of the factorial composition of course grades indicated that the factors which are important in predicting academic success at the Academy are mathematical ability, verbal ability, reading, and spatial ability, in that order. This agrees with other studies in finding that such tests are predictive of the academic success of cadets. There is also some factor which greatly affects course grades, termed 'Grade Aptitude,' but which is not measured by the actual or experimental entrance tests used in this study. This factor results from the similarity of grades received by cadets in every subject. This could be some factor like interest or effort, or could arise from the present grading system. The development of tests to measure this factor would be desirable.

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THE DEVELOPMENT OF A SCALE OF CULTURAL IDEALIZATION BASED ON THE CALIFORNIA TEST OF PERSONALITY*

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It is the purpose of this study to describe the construction of a scale, developed in connection with the California Test of Personality, Adult Form A (hereinafter referred to as the CTP), which has as its purpose the measurement of tendencies to make responses in keeping with an idealized social norm. This study also explores the relationship between this scale and the Minnesota Multiphasic Personality Inventory (hereinafter referred to as the MMPI).

The first stage of this study was instigated by the reading of a study by Kimber, entitled "The Insight of College Students into Items on a Personality Test."[1] Kimber sought to measure 'insight' by administering the CTP, Secondary, Form A, to a group of college students, asking them to make responses they thought would be made by happy, well-adjusted college students. The test was administered a second time, at which time the same students were asked to make responses in accordance with their real feelings. The fact that most individuals tended to make a higher score on the first administration than on the second was taken by Kimber as an indication of the 'insight' displayed by these individuals into the nature of the test items.

As a direct result of reading Kimber's study, this writer was stimulated into devising an 'insight scale' for the CTP which would measure an individual's tendency to give 'correct' answers

* The writer wishes to thank the following persons for their assistance in his research. Mr. Harold L. Weeks, now on leave with the Army from his position as Director of Research and Testing, City College of San Francisco, who provided considerable assistance in the way of test scoring, item counting, and professional advice; Dr. Wolcott C. Treat, Assistant Professor of Psychology, San Diego State College, who administered the California Test of Personality to his extension class in elementary psychology; Mr. Richard W. Reither, graduate student, who worked out preliminary correlations on which a portion of his study is based, and Dr. Louis Levine, Associate Professor of Psychology, San Francisco State College, who helped the writer to formulate some of the concepts which underlie the interpretation of the findings presented in this paper.

to items which most persons answer correctly only when asked to 'fake' a good score. Because 'insight' has a much broader meaning in general usage, and because the situation was that of comparing 'normal' responses on the CTP with responses made with regard to an idealized social norm, the scale thus developed will be referred to as an 'idealization scale.'

The CTP was administered under normal conditions to seventy-eight college students of elementary psychology and ninety-nine university extension students of elementary psychology. The test was readministered a week later, at which time subjects were asked to respond to test items in the way they thought would be typical of well-adjusted individuals. (This is a reversal of the procedure followed by Kimber. The change was made because of a desire not to compromise the individual's 'true score,' which might otherwise be affected by his having become familiar with the test on the first administration.)

The answer sheets were then scored by a graphic item counter and a tabulation made of the increase in 'correct' responses for each item. The thirty items which showed the greatest percentagewise increase were selected for the 'idealization key' and are listed in Table I. (Items which showed a reduction in number of 'correct' responses on the second administration of the test are listed in Table II for purposes of comparison.)

An inspection of the items in Table I reveals that those items which showed the highest percentage of gain (eighty per cent or more) on the second administration of the test seem to be similar to the 'lie' items in the MMPI (example: "I get angry sometimes."), in that they appear to be items that very few people, well adjusted or otherwise, would be able honestly and consistently to answer 'correctly.' This appears to be the case with items 26, 46, 86, 111, 118, 120, 170 and 179.

Some items, including some of those named above, appear to be related to the commonly accepted cultural stereotype of the 'happy extrovert.' This 'ideal' individual has certain well-defined qualities that most middle-class Americans would like to have, but which few can honestly say they possess. Items 16, 25, 50, 68, 71, 107, 110, 111, 116, 120, and 179 fall into this category.

Items in Table II are of a different order. The 'incorrect' answers to some of these items appear to be motivated by a

TABLE I.—TEST ITEMS OF THE CALIFORNIA TEST OF PERSONALITY WHICH SHOWED THE GREATEST PERCENTAGE INCREASE IN RESPONSES ON THE SECOND ADMINISTRATION

Item No.	Item	Correct Response According to Key	Percentage of Increase in No. of Responses on Second Administration
6)	Do you usually get upset when things go wrong?	No	46
16)	Do people seem to show an unusual interest in the things you are doing?	Yes	59
25)	Do your friends seem to think that you have made the success of which you are capable?	Yes	43
26)	Do you feel as competent in your work as you would like?	Yes	191
46)	Do you feel that you are an important member of some organization?	Yes	98
50)	Do you feel at ease in all the groups you attend?	Yes	48
68)	Do you enjoy the quietness of home more than outside groups and friends?	No	41
71)	Do you find it difficult to overcome the feeling that you are inferior to others in many respects?	No	50
80)	Even though you can conceal it, do you frequently feel irritable?	No	68
86)	Do you frequently find that you have read several sentences without realizing what they are about?	No	194
87)	Do you find that you are tired a great deal of the time?	No	51
90)	Do you have difficulty in thinking clearly when you get worried or excited?	No	47

TABLE I.—*Continued*

Item No.	Item	Correct Response According to Key	Percentage of Increase in No. of Responses on Second Administration
107)	Is it hard for you to lead in enlivening a dull social affair?	No	68
110)	Do you often assist in planning social gatherings?	Yes	63
111)	Do you usually remember the names of people you meet?	Yes	144
116)	Do you have many friends, rather than just a few?	Yes	63
118)	Do you sometimes break into conversation without intending to offend anyone?	No	86
120)	Do you try to get better acquainted with people you do not like?	Yes	106
137)	Do the members of your family get along as well as you would like?	Yes	46
139)	Are there things about members of your family that annoy you?	No	128
143)	Do members of your family have as good times together as you wish?	Yes	45
152)	Do you feel that most employers keep in mind the welfare of their workers?	Yes	54
155)	Are you doing the kind of work you like best?	Yes	55
157)	Do you feel that many employers are unfair in their methods of making promotion?	No	42
158)	Is it your belief that it is often difficult to gain promotion on the basis of merit?	No	49
162)	Do you find that many people are too critical of the work of others?	No	58

TABLE I.—*Continued*

Item No.	Item	Correct Response According to Key	Percentage of Increase in No. of Responses on Second Administration
170)	Do you often discuss community problems with people in your neighborhood?	Yes	145
174)	Do most of the people in your community agree with you in political matters?	Yes	54
175)	Do you feel that most of your local public officials are honest and efficient?	Yes	44
179)	Do you endeavor to meet new people in your community?	Yes	92
	Mean percentage of gain for all 180 items	34.25	
	Median percentage of gain for all 180 items	16.10	
	Standard deviation of distribution of percentages of gain	31.95	

cultural stereotype which says, in effect, that a 'well-adjusted' individual should never assert himself, but should be submissive, retiring, and obsequious. This stereotype apparently led an increased number of respondents to give the 'wrong' answer on the second administration to items 11, 12, 20, 21, 23, 32, and 103.

Another stereotype, that of the 'rugged individualist,' also well-known in our culture, but oddly enough at variance with the above-mentioned cultural pattern, appears to be operating in items 29, 99, 100, 102, 117, 122, 129. This stereotype did not seem to be as attractive to the group as the 'submissive' pattern, as is indicated by the fact that items associated with 'submission' show a greater percentage of decrease on the second administration.

Inasmuch as the techniques used in the development of the 'idealization key' for the CTP were in some ways similar to

TABLE II.—TEST ITEMS OF THE CALIFORNIA TEST OF PERSONALITY WHICH SHOWED PERCENTAGEWISE DECREASES IN NUMBER OF RESPONSES ON THE SECOND ADMINISTRATION

Item No.	Item	Correct Response According to Key	Percentage of Decrease in No. of Responses on Second Administration
11)	Do you feel uncomfortable when you are with important people?	No	25
12)	When you have a real grievance, do you see that it is settled?	Yes	24
14)	Do you prefer security to a new position that might pay more?	No	10
15)	Does it discourage you when people do not appreciate you?	No	12
20)	Are you often invited to social affairs?	Yes	31
21)	Do your superiors pay as much attention to you as you deserve?	Yes	11
23)	Do people usually ask for your judgment in important matters?	Yes	27
28)	Are you considered unusually capable or courageous?	Yes	12
29)	Do most of your friends go out of their way to help you?	Yes	17
32)	Do you have to do what other people decide most of the time?	No	2
99)	Is it dishonest to fail to pay a railroad or bus fare if opportunity presents itself?	Yes	3
100)	Is it right to humiliate publicly those who show disrespect for other people?	No	1
102)	Should a person be fair to disagreeable people?	Yes	2
103)	Should one always be more re-		

TABLE II.—*Continued*

Item No.	Item	Correct Response According to Key	Percentage of Decrease in No. of Responses on Second Administration
	spectful to people of greater wealth?	No	10
117)	Have you found that it does not pay to be too dependable?	No	17
122)	Do you often have to stand up for your rights?	No	5
129)	Do you find that you can get even with disagreeable people?	No	2

those used in developing the 'K scale' of the MMPI, (3) it might be hypothesized that the two scales would measure somewhat similar human tendencies. As the authors of the MMPI state: "Persons who are motivated toward getting 'good' scores (defensiveness) will tend toward higher scores on K, and those desiring 'poor' scores . . . will obtain lower values."[7]

In order to test the hypothesis that the two scales measure similar tendencies, the product-moment correlation between 'insight' scores of the CTP and the 'K scale' of the MMPI was computed. Furthermore, in order to present a broader basis for validation, correlations were also computed between the total score of the CTP and the scales of the MMPI as well as between the 'idealization' score and all scales of the MMPI. The data for this phase of the study were obtained from the case files of eighty-six men and thirty-one women who were given both the MMPI and the CTP when they were tested at a college guidance center. The cases were accumulated over a period of eighteen months. The great majority were individuals who were public-school teachers (and also part-time graduate students), were in the teacher-training program, or planned to enter teacher training. The MMPI was selected fairly routinely by the counselors of this guidance center, i. e., its selection was not limited to cases of clients who demonstrated emotional disturbances. The one hundred seventeen cases represented all those for whom complete, original test data sheets were available.

Inasmuch as the means for the total scores on the CTP showed no statistically significant difference between the sexes (men: M = 130.9; women: M = 130.6, with t = .06) the two groups were combined for the purposes of this study.

Correlations for these measures are reported in Table III. This table bears out the hypothesis that the 'idealization scale' is related to 'K,' but it also reveals that the total score of the CTP bears an even greater relationship. It thus appears that the entire CTP is rather heavily loaded with the 'K' factor.* It is interesting, therefore, to note that the 'K' factor loading of the 'idealization scale' of the CTP is less than that of the total score of the CTP, even though the derivation of the former was based on some of the premises which underlay the construction of the 'K scale.'

A comparison of values reported in Table III with those obtained by Meehl and Hathaway[3] between the 'K' factor and the other scales of the MMPI reveals much the same pattern, although there are some exceptions.

The CTP correlates markedly higher with the 'D' and the 'Pd' scales than does 'K' (r_{KD} for normals was .15 for males and .03 for females; r_{KPd} for normals was −.17 for males and −.06 for females). [3] p. 548. On the other hand, the CTP correlates markedly lower with 'Hy' and 'Ma' than 'K' (r_{KHy} for normals was .48 for males and .30 for females; r_{KMa} for normals was −.36 for males and −.28 for females). [3] p. 548. The authors of the MMPI attribute 'defensive' tendencies to 'Hy.' The low correlation reported in Table III between CTP and 'Hy' may be an indication that the CTP is not as good a measure of defensiveness as is 'K.' On the other hand, the CTP does correlate to a relatively high degree with 'K,' which is felt by the authors also to indicate defensiveness.[2] It may therefore be that the CTP measures a 'culturally acceptable defensiveness' or 'the fear of nonconformist tendencies,' which is similar in part to the defensiveness measured by 'K,' but which in turn is not related to a 'neurotic defensiveness' which may be measured by the 'Hy' scale.

Table III does not provide any grounds for assuming that the 'idealization' scale is of any present value as a 'validating key'

* The CTP is not alone in this. A study by Wesley reported in [3] reveals that the Guilford-Martin *Personnel Inventory* scales (0-Ag-Co) were also heavily loaded with 'K.'

(as 'K' is for the MMPI) for the CTP, inasmuch as the total score of the CTP correlates more highly with 'K' than does the 'idealization' score. On the other hand, the 'idealization' score can be used to better advantage than the total CTP score to predict 'adjustment' as measured by the 'K'-corrected 'Pt' and 'Sc' scales of the MMPI.

TABLE III.—RELATIONSHIP BETWEEN SCORES ACHIEVED ON THE CALIFORNIA TEST OF PERSONALITY AND THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY (N = 117)*

MMPI Scales	CTP Total Score	CTP "Idealization"
L	.31**	.26**
K	.64**	.42**
F	−.50**	−.37**
H_s	−.32** (.00)*	−.31** (.12)*
D	−.43**	−.49**
Hy	.01	−.01
Pd	−.44** (−.04)	−.38** (−.16)
Mf (86 men)	−.26**	−.18
Mf (31 women)	−.11	−.27
Pa	−.04	−.10
Pt	−.62** (−.16)	−.59** (−.57**)
Sc	−.56** (−.17)	−.59** (−.50**)
Ma	−.13 (−.03)	−.06 (.00)
CTP "Idealization"	.85**	.....

* Values in parenthesis represent correlations with MMPI scales which have been corrected by the addition of the 'K' factor in accordance with the *Supplementary Manual for the Minnesota Multiphasic Personality Inventory.*[2]

** Significant at one per cent level of confidence. (There were no values at the five per cent level of confidence.)

An additional conclusion which can be drawn from Table III is that there is a statistically significant relationship between the CTP total score and all three of the validating scales and five out of the eight 'clinical scales.' Although the correlations between the 'idealization' scale and the scales of the MMPI are not as high as those between the latter and the total score of the CTP, it is less affected by the application of 'K' correction, in that its significant relationship to the eight 'clinical scales' of the MMPI drops from five to three by the application of 'K' correction.

Perhaps the most significant statistic is the very high correlation which exists between the 'idealization' score and the total score of the CTP. A correlation of this magnitude raises the strong probability that the CTP measures an individual's tendency to 'idealize' his behavior, i.e., to see himself in the best possible light, rather than his personal and social adjustment, which the test purports to measure. This hypothesis is further supported by the high correlation which exists between the total score of the CTP and the 'K' score of the MMPI, which, as was noted above, also measures a tendency to try to get 'good' scores.

It may be, therefore, that the CTP has a valid use as a measure to determine (1) the extent to which an individual has adopted the cultural norm as his personal standard of behavior, and (2) the tendency of the individual to assert that his behavior conforms to the norm. Obviously, extensive research will be necessary to establish the CTP's validity in this area. Furthermore, the relationship between the total score of the CTP and the 'idealization' score is so high, that the latter might be used in such research as a brief form of the former.

SUMMARY

An 'idealization' scale was constructed for the California Test of Personality, Adult, Form A, from the thirty items most likely to be changed to 'correct' answers by respondents who were requested to produce scores typical of 'well-adjusted' persons. Scores made on the 'idealization' scale and the total scores of the CTP were compared with the 'K' scale of the Minnesota Multiphasic Personality Inventory. It was found that the total score of the CTP correlated more highly with the 'K' scale than did the 'idealization' score, even though the 'idealization' scale was similar in concept and development to the MMPI 'K' scale.

It appears, furthermore, that the total score of the CTP is so heavily loaded with 'K' factor as to raise doubt about its value as a measure of 'adjustment.' There is a possibility that it measures 'culturally acceptable defensiveness' or 'fear of nonconformist tendencies' rather than the 'personal and social adjustment' it purports to measure. Although the CTP does correlate significantly with five of the eight 'clinical scales' of

the MMPI, this number drops to one when the 'K' correction is applied to appropriate MMPI scales. In spite of the fact that the correlations of the 'idealization' scale with 'clinical scales' of the MMPI are consistently lower than are correlations of these measures with the total score of the CTP, the 'idealization' scale is a slightly better predictor of adjustment as measured by the MMPI inasmuch as its significant correlations drop from five to three when 'K' correction is applied to MMPI scales.

On the other hand, the 'idealization' scale is open to question as a measure of 'adjustment' because it is composed in part of eight items similar to those used in the 'Lie' scale of the MMPI and eight additional items apparently related to the American middle-scale cultural stereotype of the 'happy extrovert.' No evidence was discovered which would indicate the value of the 'idealization' scale as a validating key for use with the CTP. However, it may be that the CTP or a shorter edition in the shape of the 'idealization' scale might well be used as an instrument to measure (1) acceptance by the individual of the cultural norm as his own behavior standard, and (2) the tendency of the individual to assert that his behavior conforms to the norm. Additional research is needed to validate the CTP for use in this area.

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PSYCHOLOGY FUNCTIONING IN THE EDUCATION OF TEACHERS

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The most difficult and challenging aspect of teaching is its human material. From an awareness of this fact the instructor in educational psychology can never hope or wish to be free. Thereupon questions arise: How can I make my course more useful for these students? How can their direct experiences and the systematic generalizations of psychology become functionally related? Is there danger of over-emphasizing the student's personal contact with youngsters? Of neglecting conceptual principles?

In the beginning we assume that the college instructor willingly 'accepts' a wide variety of students, and that he adopts the related principle of 'beginning where each learner is.' This assumption may be a rather large order for college circles, although these attitudes are well established in the modern elementary school and are receiving growing recognition in the secondary school. It is not uncommon, however, to hear a college instructor say: "That freshman should never have been admitted." While this complaint is often based somewhat narrowly upon a subject-matter or skill deficiency, the instructors in the professional education courses are more apt to reject a student because he lacks interest in the pupils, treats them harshly, or has other personal deficiencies that are likely to interfere seriously with his ever gaining the confidence of a group of youngsters and their parents. Certainly, a college faculty can more readily 'accept' all new entrants as worthy students in their classes when that faculty has participated in designing the 'selective admissions' program. Granted this favorable condition, two aspects of 'acceptance' stand out: the student's attitudes toward teaching and his social-intellectual qualifications.

MOTIVATIONAL 'ACCEPTANCE' AND THE YEAR-LONG CHILD STUDY PROJECT

The freshmen students the writer meets in a child development course come in most cases with a vital interest in individuals based solidly upon considerable experience as 'baby-sitters

and feeders,' as assistants in playgrounds and camps, as participators in community organizations for youth, and as trusted guides of their younger brothers and sisters. The chief opportunity here is to use and strengthen these motives by continuing their functioning while a refining process is occurring in terms of scientific child study procedures with comprehension of systematic generalizations about human behavior. One device employed to these ends is an off-campus individual-study 'project' growing out of the student's previous experience with youngsters in his home town.

According to typical procedure in this 'project,' the student early in the fall semester of his freshman year selects, in conference with the instructor, an individual from among the boys and girls whom he knows in his home community. The criteria of selection are the student's interest in the particular person, the availability of home, school, and other contacts, and the probable aid to the student in gaining a wider and deeper understanding of behavior. Plans are made in student-instructor conferences and in small group and class discussions for the first contacts during the Thanksgiving holiday. Most students begin their study by writing a brief thumbnail sketch or preliminary estimate of the individual based upon their previous contacts, which may range in degree from a cursory acquaintance to close friendship or responsible care, and may have extended over a few months or through all the years since the child's birth. During the Thanksgiving, Christmas, mid-winter, and Easter holidays each student makes a variety of contacts with his 'study,' and these observations are reported in writing with an endeavor to distinguish between the objective description of the behavior and the student's more or less subjective interpretation. In student-instructor conferences, occurring between each series of contacts with the home-town youngster, the project is guided and integrated with the concepts developing in the class discussions. Thus the student has an extended dialectical interplay between observations of an individual he knows increasingly well and the principles of development and learning.

Motivation and guidance in the child study are supported by a combination of experiences, including viewing and discussing motion pictures that help explain behavior, the observing of boys and girls in the campus school with interpretations of their

behavior under the guidance of the children's teacher, and the reading-discussion procedures of the college-class group. Another avenue of motivation in the psychological field arises out of the fact that almost everyone is highly interested in himself and may become concerned readily with an understanding of his own behavior. This kind of motivation usually develops in more useful and genuine form, however, when it comes indirectly and gradually through the analysis of the behavior of youngsters or of one's mates, until the student reaches a stage where he voluntarily turns the psychology back upon himself at the rate at which 'he can take it.' As the student increases his interest in the psychology of behavior it becomes much easier for his instructor to 'accept' him as a student in so far as his attitudes are concerned.

BALANCING 'ACCEPTABILITY' IN INTELLECTUAL AND SOCIAL QUALIFICATIONS

Another aspect of the 'acceptance' of students is related to their intellectual and social qualifications. Whether we are speaking of selective admission and exclusion of certain students from the professional college or of the way in which the instructor treats the admitted students in his class, it is sounder to put the intellectual and social qualifications together than to think of them separately. A student may be highly motivated to enter teaching either through his direct interest in youth or in the teaching of his chosen subject matter, but he may be disqualified either on intellectual or social grounds. It is widely assumed that an IQ of 115 and a respectable record in high school qualifies a young person for entrance upon a collegiate course leading into the teaching field. While it is desirable to have sufficient intellectual ability to deal with concepts and generalizations so that the direct experiences with youngsters can be translated into principles and thus function over a wide area, this ability to think from the concrete to the abstract cannot stand alone. Although our IQ tests are the best quick measures for this generalizing, conceptual ability, other qualities enter into the effective intelligence of teachers as they work with their human subject matter.

Among the attendant social qualifications of the teacher to which attention has been called by recent studies are the relations between the social-class backgrounds of the pupils and of

the teacher. It has been demonstrated that the vocabularies of lower-class and middle-class families differ sufficiently to make tests based upon a middle-class vocabulary largely incomprehensible to lower-class children.[1] Here we have an extension of the long adopted principle that the teacher's vocabulary, as used in the classroom, must fit the kindergarten, the third grade, the junior high school, and perhaps even the freshman college level. One partial solution would be that our middle-class teachers learn a lower-class vocabulary. A still more adequate move may be the admission and acceptance of more entrants into teaching from lower-class backgrounds than occurs at present, even though they fall lower in the scale in their facility in making verbal generalizations. If we look in the opposite direction, we may find that certain upper-middle-class students, whose IQ's are in the top decile, are disqualified because they have not and cannot acquire functional appreciation of lower-class attitudes. While it is possible to acquire a new language, it is more difficult to take on the culture of a foreign people. According to the social anthropologists, who have studied this problem most closely, a difference in social class between teacher and pupils may render the teacher an ineffective 'foreigner.' In so far as we do 'accept' prospective teachers from various social classes, and in so far as they do commonly teach in the public schools children from a wide range of social stations, we have a heavy obligation to help these teachers toward an appreciation of their own social class limitations and assets and toward ways of overcoming these barriers or building on their shared experiences.

The functioning of psychology in the development of the student-teacher into a master-teacher involves, then, a fully sympathetic experience with children, which can interact with a growing comprehension of the general principles of learning. Thus the functional ability to use these concepts in a wide variety of situations is acquired. Within this intellectual process barriers of inhibiting emotional attitudes toward pupils of certain social backgrounds must be removed. In addition to high barriers of caste and class difference, many other blockages in student thinking about human development and in attitude toward child behavior are derived from subgroup distinctions.[2] Religious views, such as Catholic, Protestant, Jewish, or agnostic,

often stop students cold as they meet evolutionary concepts, animal experiments on learning, or the speech and behavior of a child of differing faith. Likewise, rural or urban rearing may separate the teacher from the child,[3] while the teacher brought up in the home of the labor leader may have difficulty in the social-studies class as he meets the convictions of the banker's son. Still deeper lie the cultural inheritances of many second generation immigrants who are entering the teaching field to encounter the children of 'Old Americans.' Deepest of all are the family and personal histories of our students, which have implanted in their characters the attitudes associated with an over-protected, an indulged, a neglected, or a rejected childhood. How are we to reduce during the collegiate years, or even later, the proportion of teachers who are ineffective because they are too rigidly organized emotionally or too loosely organized intellectually, extrovertive, blatant showmen or introvertive, insecure persons, dependent and affection-seeking or just fatigued and inadequate?[4]

MAKING TEACHER EDUCATION SPECIFIC FOR THE INDIVIDUAL STUDENT

The solution of these many difficulties, which the student encounters during his college years in trying to become at the same time a mature person and a master-teacher, lies in making both his 'general' and professional education more specific. (If this statement is paradoxical, let us make the most of it!) Since each student has his own peculiar barriers of meagre contact with children, difficulty in grasping verbal concepts, emotional blockages in accepting certain strange children, parents, and instructors or certain new ideas, we may help him find these particular blocks and reduce them. This kind of 'specific' education is necessary for any student to gain either 'general' education of professional competency. While the instructor in child development or educational psychology may meet a large number of students, he should assume considerable responsibility for doing what he can to aid each one. Fortunately, the nature of his subject matter enables him to enlist the student in the spotting of his own inhibiting attitudes. As the student comes to appreciate the difficulties of children and adolescents in learning, he may be able to turn some of this perceptive insight

upon himself. Through participation in the analysis of his own learning inhibitions, the student may be enabled to overcome them measurably when aided by occasional conferences with the instructor.

With this view of the specific functioning of the psychological principles of development in the student's own life before us, let us consider other experiences that may help him in understanding children and himself. As film production in this field has moved beyond the recording of developmental age norms of physical and intellectual behavior to the presentation of life histories of individuals and the dynamic reactions of children in social groups, many new possibilities are opened. The student viewing these more deeply psychological films reveals to the discerning instructor in his individual written reports on questions designed with projective intent his particular difficulties in the interpretation of behavior and to some degree his own personal inhibitions. In the class discussion that follows, the more common misconceptions can be corrected, and to some extent the deeper emotional difficulties of individuals may be relieved by the back-and-forth discussion among the students. That is, the instructor may so guide the class discussion as to bring about the favorable results associated with group therapy. A film experience that has been shared by all students constitutes also a source of illustrative counseling during individual student-instructor conferences. Thus the modern film with its increasingly helpful commentary constitutes an indispensable resource in the specific education needed to remove intellectual, emotional, and social barriers of both prospective and practicing teachers.[5]

THE CAMPUS-SCHOOL TEACHER'S DISTINCTIVE CONTRIBUTION

Another valuable form of guided experience is the group observation of children with their teacher in class activities, when followed by a group conference of the students with the children's teacher and the college instructor. In actual practice in the teachers college having an adjacent campus school, this procedure under certain conditions has possible values far beyond those found in film viewing. With optimum arrangements the campus-school teacher of the fifth grade, for example, meets in a pre-conference with the group of students who are to observe

the grade. During this pre-conference the campus-school teacher learns of the interests and concepts of the students concerning ten-year-olds, and the students in turn gain a preview of the fifth-grade program and of the group of youngsters. The following class session is spent by the group of students observing the fifth grade.

In planning such group observations a number of factors need to be considered, especially the welfare of the children and the students. The number of students included in a given observation is kept as high as possible to conserve the time of the campus-school teachers, who serve a large number of college students, as well as the time of the classes. The more students who attend a given observation with its pre-observation and post-observation conferences, the less time does the fifth grade undergo any possible hardships of observation and the less time the campus-school teachers devote to the observation phases of their work. The contrasting aspect of the economy is to keep the number of students low enough so that no harm and some beneficial effects come to the campus-school children through the observation contact. The optimum number between these opposing criteria varies greatly with such factors as (1) the space available for children and students, from a small classroom already almost filled with children to a gym floor, play group, shop, or library with ample room for twenty-five children and thirty-five observers; (2) the character of the activity from discussion in small groups, where observers press close in order to hear so that in large numbers they seem intrusive, to free play in the kindergarten or art work in the fifth grade, where the observers are less noticed or may even mingle helpfully with the youngsters; and (3) the age of the children from kindergarteners, who often almost ignore a crowd of visitors, to adolescents, who are sometimes embarrassed even by a few observers. Perhaps more important than any of these factors are the conduct and attitude of the observers, based upon a growing mutual understanding, often accompanied by the beginnings of participation, between the college students and the campus-school youngsters. In so far as these several conditions can be met appropriately, each member of the college class gains the values that lie in a shared experience, which can be reconstructed and critically appraised in the post-conference during the following class period. Here

the campus-school teacher becomes the guide supported by the college instructor. The students' appraisals of individuals are thus evaluated in the light of the fuller and deeper understanding of each boy or girl's personality possessed by the child's own teacher, while the college instructor may help the students carry these specific interpretations toward valid generalizations.

As college instructors lead their students into an extensive program of more or less direct experience through intensive studies of individuals, the viewing of psychological films, and the observation of campus-school pupils, they find that specific experiences can absorb a student's attention so fully that his understanding of the general psychological principles of development and learning may be neglected. In other words, collegiate courses may become too concrete and specific, although the opposite weakness of dry abstractness and not-too-glittering generality is more frequently encountered. It thus becomes evident that the student needs help in translating his concrete experiences with children into generalized concepts that are woven into a systematic comprehension of the psychology of behavior.

To make the student's rich, vivid, absorbing experiences become actually functional, consistent attention needs to be given by instructor and student to the conceptualizing aspect of the learning process. Here both can stand upon the shoulders of William James, Sigmund Freud, Walter Cannon, Kurt Lewin, and many another contributor to the psychology of life and education. The task of the instructor in child development or educational psychology is largely that of relating the fundamental principles found in the writings of past and present thinkers to the activities in which the students are engaged. The instructor's emphasis may vary between the person interested in the learner and the one more interested in the content to be learned. Every student needs to be guided, however, toward being both a careful reader of old and new books and an acute observer of the behavior of children and adults. Thereby, a student-teacher, whether a college freshman or a teacher with many years of classroom contacts, may become a sounder thinker and more tactful guide of children. Neither friendly companionship with youth nor critical reading of the great psychological treatises will by itself produce a functional understanding of educational psy-

chology. For psychology will function in the education of teachers only when the practical and theoretical aspects, the specific experiences and general principles, become inter-related in the thoughtful action of students of education.

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THE EFFECT OF MUSIC DISTRACTION UPON READING RATE AND COMPREHENSION

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A question of some importance in education and psychology is that of the effects of distraction upon human performance. In the educational field, this question takes the form of whether various distractions adversely affect the student's efforts to learn. Of the distractions to which a student may be subject, one of the most common appears to be radio listening. Cantril and Allport[2] report that a substantial majority of students study while listening to their radios (68 per cent). Reading and study experts such as McCullough, Strang and Traxler[11] and Robinson[16] feel that unless the radio is kept very low in volume it serves as a distractor, adversely affecting speed and comprehension in study.

Published studies concerning the effects of supposedly distracting influences upon intellectual tasks such as reading, problem-solving, and test-taking present conflicting conclusions. Whitley,[19] Fendrick,[4] Liepold,[8] Henderson, Crews and Barlow,[6] and Mitchell,[13] among others, report that some of their subject groups show the effects of one or more kinds of distractors, in terms of poorer performance on intellectual tasks. However, Morgan,[14] Hovey,[7] Obata, Morita, Hirose, and Matsumato,[15] and Miller,[12] find the presence of various distractors no hindrance to such performance. Morgan, in fact, reports facilitation, as do Obata, Morita, Hirose and Matsumato. Some studies, such as that of Tinker,[18] find no significant differences either way. Some studies (e.g., Tinker, Liepold, Mitchell) suggest that the amount of distraction differs for different levels of intelligence. Others (e.g., Hovey) disagree. Most investigators in this area agree that verbal radio programs are more distracting than musical programs. However, there is some disagreement as to the actual effects of distractors upon such intellectual tasks as those mentioned above. In other words, the presence of these distractors may not be disturbing.

Perhaps one reason for the seeming disagreement among the studies cited lies in the fact that some investigators used only one kind of distractors. For example, Tinker used electric bells.

Fendrick used semi-classical music only. On the other hand, some investigators used more than one form of distraction with the same experimental groups. For example, Morgan used bells, buzzers, and phonograph records of music and humorous monologue. Hovey used bells, buzzers, spotlights, phonograph records, whistles, and a buzz saw. Henderson, Crews and Barlow used both vocal and nonvocal music. Liepold played radio programs varied from newscasts to soap operas to his subjects.

Perhaps another reason for the apparent disagreement lies in the difficulty of achieving adequate sampling. Tinker advised caution in interpreting his results because of the small numbers of subjects used. Fendrick's study, included in a recent book by Hartley, Birch and Hartley,[5] apparently is considered to be one of the best of its kind by these authors, and it is also cited by Robinson.[16] Even so, Fendrick used two consecutively-taught classes in Introductory Psychology as subjects. The equation of his groups has been criticized by Henderson, Crews and Barlow.[6] These latter authors, in extending Fendrick's study, used fifty freshmen women as subjects, divided into three equated groups.

It was the intent of the present study particularly to extend Fendrick's study and that of Henderson, Crews and Barlow by way of improved sampling and analysis. In addition, where Fendrick used only semi-classical music, and Henderson, Crews and Barlow used only classical and popular music, the present study involves four types of music. These are: classical, semi-classical, popular and jazz. The present study is restricted to the use of nonvocal music, thereby avoiding a complication noted in the study of Henderson, Crews and Barlow.

Two questions are raised in the present study. First, does listening to specific types of nonvocal music (classical, semi-classical, popular and jazz) have any significant effect upon rate of reading and reading comprehension? Second, are rate of reading and reading comprehension in the presence of music a function of the subject's intelligence?

MATERIALS AND PROCEDURE

Reading Material and Reading Test.—The reading material used in the present study was expanded from the Robinson-Hall Test for Reading Ability (History: Form—Russia).[17] As

published, this test has a time allowance of ten minutes. Enough material was added from the section on Russian history in the 1950 edition of *Compton's Pictured Encyclopedia*[3] to make up a selection containing 1315 lines, or approximately 11,500 words. To test the assumption that the subjects would be unlikely to finish this selection in thirty minutes, five graduate students in psychology read the selection and were unable to finish in thirty minutes.

The material was offset-printed in the University's printing shop. It was similar to many college texts in type and general form, with titles for each major section. The lines were numbered, and rate of reading was determined by having the subjects mark the line being read when time was called.

The reading comprehension test consisted of fifty mimeographed true-false questions. True-false items were used because of time limitations. Twenty-five questions were over the first third of the material, fifteen were over the second third, and ten were over the last third. It was assumed that few subjects would read far enough to answer many questions over the last third of the selection, and that having relatively more questions over the first two-thirds would yield a more reliable comprehension score. The questions were numbered to correspond with the lines from which they were taken. Subjects were instructed to answer only questions over lines which they had read, as indicated by the numbers. The comprehension test was scored by subtracting the number wrong from the number right, as recommended by Lindquist, Hawkes and Mann.[10]

Music.—The music used in the present study was chosen after consultation with members of the University's music faculty as being representative of the types of music desired. The writers acknowledge the subjective nature of this procedure. The music was played on a Webster three-speed automatic changer playing through a Bell high-fidelity amplifier with a suitably baffled ten-inch speaker. The following selections were played.

Group II: (Classical music) *Symphony No. 3 in E-flat Major*, Beethoven

Group III: (Popular music) *You Made Me Love You, Music Makers, The Flight of the Bumble Bee, Concerto for Trumpet, Ciribiribin, Sleepy Lagoon, One O'Clock Jump*, all played by

Harry James and his orchestra; *I've Got My Love To Keep Me Warm, Dardanella, Just One of Those Things, Sophisticated Swing,* all played by Les Brown and his orchestra.

Group IV: (Semi-classical music) *Mississippi Suite, From The Land of the Sky-Blue Water, By The Waters of Minnetonka,* all played by Andre Kostalanetz and his orchestra, and *Grand Canyon Suite* from another album by the same artist.

Group V: (Jazz music) *Jazz Me Blues, Panama, Tin Roof Blues, High Society, Struttin' With Some Barbecue, Chimes Blues, Muskrat Ramble, South Rampart Street Parade,* all played by Jimmy Dorsey and his orchestra; *The Girls Go Crazy About The Way I Walk,* played by Kid Ory and his Creole Band; *Tishomingo Blues,* played by Bunk Johnson and his New Orleans Band.

Subjects.—Two hundred eighty-three students in eight classes of Introductory Psychology were randomly assigned to the five groups used in the study. As was expected, some students in each group failed to keep their appointments. However, a total of two hundred eight subjects completed the study, with approximately forty in each group. The parent population, of course, comprises the two hundred eight subjects who finished the study.

Motivation.—In a study of this kind, it is desirable to conceal the true nature of the experiment from the subjects, as indicated by Baker.[1] Many investigators have not observed this precaution. The subjects used in the present study were told that the study involved reading speed and comprehension, to last not more than one hour, and that their scores would be made available to them upon completion of the study. No mention was made of the music, which was played from an adjoining room, as described below. All subjects were informed that there were other activities going on in the building at the time the reading took place, but they were asked to study as they usually do under such circumstances. The music was playing when the subjects entered the room, and for a brief time after the conclusion of the thirty-minute reading period. When asked to indicate on their question forms, after reading was completed and the comprehension test had been taken, whether anything going on in the building was annoying to them while studying, a majority (one hundred fourteen) of the subjects said that the music was annoying. However, it is thought that no particular set with

regard to the music was aroused prior to the reading. Only one or two subjects in each experimental group asked if the music was part of the experiment, and these were told that it was not. Since not all the reading sessions took place on the same evening, it is possible that some discussion of the study took place between subjects who had participated and subjects who had not, although the subjects were asked not to discuss the study outside their own groups until all groups had participated.

Experimental Setting.—All reading sessions took place in a regular classroom of the Psychology Department. This room is twenty-four feet long, nineteen feet wide, and ten feet high. The door to this room was closed during the reading. Illumination came from six fluorescent fixtures hanging from the ceiling at regular intervals, each with two 40-watt tubes. The subjects sat in classroom armchairs, with the lights at a height of sixty inches above the arms of the chairs. The reading sessions took place in the evening, to avoid conflicts with class schedules.

The phonograph was in an adjoining room, from where the music was clearly audible in the reading room. Since the walls were quite thin, and since a high-fidelity amplifier was used, there was a minimum of distortion. Extent of distortion and optimal volume settings were subjectively predetermined by the writers. The volume was not 'low,' that is, it was not near masking level, or threshold level, but was at about the volume level at which one would have it if his intention were to listen to the music. McCullough, Strang and Traxler[11] and Robinson[16] have stated that music at a very low volume level may not be distracting. It was the intention of the writers to have the volume very much louder than this, without being so loud that distortion would result.

The reading selection was placed, closed, on the chair arms before the subjects arrived. When the subjects in a given group were seated, oral directions were read to them. Just before the subjects began to read, the door to the experimental room was closed as a signal to the phonograph operator in the next room to change from the music which had been playing to the list of selections chosen for the group which was present. Subjects were told ahead of time not to enter the experimental room if the door was closed when they arrived. Despite this, two subjects in the jazz group did enter the reading room a few minutes late.

While their scores were not included in the computations, the effect on other subjects in the jazz group cannot be evaluated.

RESULTS

Does Listening to Specific Types of Nonvocal Music, Classical, Popular, Semi-Classical, and Jazz, Have a Significant Effect on Rate of Reading and Reading Comprehension?

In Table I, it can be seen that the mean rates of reading of the experimental groups were somewhat higher than that of the control group. However, a simple analysis of variance yielded

TABLE I.—MEAN RATE AND COMPREHENSION SCORES FOR THE CONTROL AND EXPERIMENTAL GROUPS

	I control n-43	II classical n-46	III popular n-42	IV semi-classical n-40	V jazz n-37
Mean No. Lines	648.23	696.54	704.05	695.25	716.59
SD	112.11	159.65	159.83	148.27	111.45
Mean Comprehension	13.40	13.57	13.62	12.95	12.22
SD	5.81	8.95	6.40	5.09	7.68

an F-ratio of 1.37, which would indicate that in general there were no significant differences among the groups. A t-test shows that the mean rate of the jazz group is significantly higher than the mean rate of the control group (five per cent level of confidence). No other mean differences were significant. Morgan[14] suggested that extra effort is put forth to compensate for distraction. It may be that the marked and regular rhythm of the jazz music aided in making extra effort. Fendrick,[4] in fact, estimated that fifteen per cent more of his distracted group finished reading than of his non-distracted group. However, Henderson, Crews and Barlow[6] have pointed out that Fendrick's groups were not actually well equated in the first place.

Table I also contains the comprehension scores for the groups used in the present study. A simple analysis of variance yielded an F-ratio of .78, which is not a significant figure. Furthermore, a subsequent t-test indicated no significant differences between any two comprehension score means. This is not in agreement with Fendrick, who obtained a statistically significant difference favoring his non-distracted group. It does, however, agree with the general conclusions of Henderson, Crews and Barlow.

There is here no reason to reject the null hypothesis that there are no significant differences in the reading rates and reading comprehension scores of the groups involved in this study.

Is the Rate of Reading and Reading Comprehension in the Presence of Music a Function of the Subject's Intelligence?

The subjects in each group were divided into three levels of intelligence on the basis of their ACE percentile rankings. These levels were: from the first to the thirty-third percentile, inclusive, from the thirty-fourth to the sixty-seventh percentile, inclusive; and from the sixty-eighth to the one hundredth percentile, inclusive. Table II contains the mean rate and comprehension scores for the subjects so classified.

TABLE II.—MEAN RATE AND COMPREHENSION SCORES FOR CONTROL AND EXPERIMENTAL GROUPS, BASED UPON THREE INTELLIGENCE LEVELS

	I	II	III	IV	V
	control	classical	popular	semi-classical	jazz
ACE percentile	n-40*	n-41	n-40	n-37	n-37
1–33					
Mean no. lines	605.38	647.73	656.36	634.31	674.14
Mean comprehension	8.25	8.18	9.27	10.62	5.43
	n-8	n-11	n-11	n-13	n-7
34–67					
Mean no. lines	627.94	658.40	656.75	677.21	727.53
Mean comprehension	12.69	11.67	11.17	12.50	13.18
	n-16	n-15	n-12	n-14	n-17
68–100					
Mean no. lines	668.44	774.20	777.35	760.40	721.31
Mean comprehension	15.81	20.33	18.12	15.30	16.54
	n-16	n-15	n-17	n-10	n-13

* These n's differ from those in Table I because the ACE scores were not available for five of the two hundred eight subjects who completed the study.

Factorial analyses of variance for rate of reading and for reading comprehension separately were undertaken upon the data in Table II, with corrections for differences in group sizes being made in accordance with Lindquist.[9] For rate of reading, insignificant F-ratios were obtained both for conditions (F = .31) and for level of intelligence (F = .33). A subsequent t-test, made from the data of the factorial analysis of variance, showed

no significant mean differences. The interaction variance was significant beyond the one per cent level (F = 45.35).

Factorial analysis of variance of the comprehension scores in Table II yielded an insignificant F-ratio for conditions (F = .24), while the F-ratio for intelligence level was significant beyond the one per cent level (F = 25.87). The interaction variance was not significant (F = 1.64). A subsequent t-test verified the absence of significant mean differences.

There is thus no indication that rate of reading or reading comprehension in the presence of music are functions of intelligence as classified in the present study, under the conditions described. This conclusion agrees with that of Hovey,[7] but is in disagreement with Mitchell,[13] Tinker,[18] and Fendrick[4] on this point.

SUMMARY

Two hundred eighty-three students in introductory psychology classes at Bowling Green State University were assigned at random to one control and four experimental groups, to test the influence of music upon reading rate and reading comprehension. The study was completed by two hundred eight subjects, with approximately forty in each group. Four types of music were played, classical, semi-classical, popular and jazz, one type for each of the four experimental groups, while they read a prepared selection in Russian history for thirty minutes. The control group read without musical accompaniment. A fifty-item comprehension test followed the reading for all groups. The data were analyzed by means of analysis of variance, factorial analysis of variance, and the t-test. These analyses revealed no significant differences in the performance of the groups, except that the jazz group read significantly faster than the control group ($P < .05$). It should be noted that the analysis of variance yielded an insignificant F-ratio for the same data. This significant *t*, then, may be suggestive, but in the present analysis it would be a mistake to attach much importance to it. No significant relationship was found between level of intelligence and the influence of music distraction upon either rate of reading or reading comprehension.

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SHOULD STUDENTS CHANGE THEIR INITIAL ANSWERS ON OBJECTIVE-TYPE TESTS?: MORE EVIDENCE REGARDING AN OLD PROBLEM

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THE PROBLEM

Students have frequently asked instructors or counselors whether it is advantageous to change answers on objective-type tests providing time permits a second consideration of at least some of the items. Many students have received the reply that first impressions are best; others have been told that a second consideration of an item is likely to be better than the first. In one sample,[8] a majority of students questioned on the issue believed that it is better not to make such changes, possibly indicating they had been previously so advised. This issue, of course, should be decided on basis of facts rather than upon opinions.

Previous reports relating to the present question actually deal with two different problems. The first problem of most immediate practical import (to the students, at least) is the determination of whether revisions in answers tend to raise or lower the total score on the test. Several investigators[1,6,7,8] have been unanimous in concluding that scores on multiple-choice and true-false tests are increased more than they are lowered by the incidence of changed answers. The amount of such gains has variously been related to the type of test, the relative achievement of the student, the instructions given, and to the proportion of items changed. It has been agreed that: (1) most of the changes are made on items upon which the student is uncertain originally; and (2) bright students change relatively few of the easy, 'most visible' items, although they recognize more readily than do the duller students the need for a second consideration of items requiring niceties of discrimination. A second problem relating to this topic has been investigated by Jarrett,[5] who was interested primarily in determining whether revisions in answers arise from chance-determined factors or from the operation of sub-threshold response tendencies. He concluded in favor of the latter.

The purpose of the present study is to return to the original problem, thus seeking additional data regarding the effect of revised answers upon total scores and letter grades earned, and to further analyze the results according to sex, grade earned, and serial position of items changed. An account of the nature of all revisions will be presented first, followed by a test to discover whether the net result of changing responses is a gain or a loss to the student. The results should furnish a more substantial basis for guidance of students in respect to this aspect of the skill of test-taking. It should be noted that this study does not purport to determine whether first impressions are best, since conceivably students may often record their second or third impressions as the first overt answer to the item.

PROCEDURE

Answer sheets were examined for one hundred twenty-four students who took a final examination in a course in General Psychology in January, 1950, at the University of Hawaii. The examination items were of the four-answer type. Students recorded their answers to each item by marking an 'X' in one of the four columns in the answer sheet corresponding to the four alternatives offered for each question. A maximum time of two hours was allowed for the completion of the 130-item test. Most students had ample time to reconsider and change items if they so desired. No special instructions were given, since it was considered not desirable that the students should be aware that the answer sheets would be used for other than grading purposes.

The procedure of analysis was to identify, on each answer sheet, the answers which had been changed. These were indicated by erasures or by cross-outs. Careful recheck of the answer sheets under high illumination seemed to indicate a high degree of accuracy in locating such changes. Next, the changed answers were classified into three major categories: (1) items changed from the right answer to a wrong answer; (2) items changed from a wrong to the right answer; and (3) items changed from one wrong answer to another wrong answer. It was discovered that nine hundred seventy-three of the total one thousand one changed answers were included by these three categories. Obviously, responses in categories 1 and 2 affect the score on the examination, whereas items in category 3 do not.

RESULTS AND DISCUSSION

Over-all trends.—The sixty-seven male students, as seen in Table I, made a total of four hundred sixty-two revisions in their answers, of which one hundred two or twenty-two per cent represent changes from right to wrong answers, tending to lower scores that much, whereas two hundred forty-four or fifty-three

TABLE I.—NUMBER, PERCENTAGE, AND TYPE OF REVISED ANSWERS MADE BY 124 STUDENTS ON A MULTIPLE-CHOICE EXAMINATION IN GENERAL PSYCHOLOGY[1]

Number of Students		Category 1: Right to Wrong		Category 2: Wrong to Right		Category 3: Wrong to Wrong		Total number of Revisions
		N	%	N	%	N	%	
Males	67	102	22	244	53	116	25	462
Females	57	122	24	232	45	157	31	511
Total	124	224	23	476	49	273	28	973

[1] Total number of responses: 16,120. Total number of changed responses: 1,001. The twenty-eight changed responses not included in the three categories above were: Right to Right; 17. (Indicated by erasure and re-mark.) Two revisions; final answer incorrect, 8. Two revisions; no final answer, 2. One revision; no final answer, 1.

per cent represent answers changed from wrong to right, resulting in a net increase in the scores. The remaining one hundred sixteen items were changed from one wrong answer to another; these may be significant pedagogically, but they have no influence on the scores and they represent a waste of time and effort. Similar results are shown for the female students and for both sexes combined.

In order to test the hypothesis that there is no net change in score brought about by making revisions, chi-square values were computed for each sex separately and for the sums for both sexes. They indicate that the data depart from the hypothetical 50–50 distribution of responses into categories 1 and 2 at the

one per cent level of confidence. The practical conclusion is that these students gained much more than they lost by making the changes in their answers on these items.

The agreement between the present results and those cited above suggests that one might expect similar results from still further sets of examination papers which might be studied.

Sex differences.—Whereas the mean number of revisions for all students was 7.8, the mean for the women was 9.0 as compared to 6.9 for the men. Thus, the women changed answers more frequently than the men but they profited from this slightly less than did the men. The data suggest that the males were better students. It seems a possibility that the women in the sample changed more responses and improved their scores less than the men because they were poorer students rather than because they were women.

Item position.—Fewer revisions were made upon items placed near the end of the test than upon items appearing near the beginning. This presumably could have been due to decreasing difficulty of the items, to different subject matter covered, or to increasing 'fatigue' or increasing carelessness toward the end of the test. It must be recognized, of course, that some changes on items placed near the beginning of the test may have actually been made near the close of the test period.

Number of revisions in relation to letter grade earned.—Table II summarizes the three major types of changed responses according to the letter grades earned. For the men there was a clear inverse relationship between grade earned and proportion of items changed from right to wrong. This trend was somewhat less consistent throughout the grade range for the women, but the relationship appears again in the totals for both sexes. Conversely, the proportion of items changed from wrong to right is greater for persons earning high grades than for persons earning low grades. As might be expected, changes from one wrong answer to another wrong answer is more characteristic of students earning low grades than of those placing higher. In summary, it appears that the poorer student makes more revisions, but the proportion which turn out to be unfortunate for him is greater than is true for the better student. Nevertheless, at all grade levels, the percentage of wrong to right revisions tends to exceed the percentage of right to wrong!

TABLE II.—NUMBER, PERCENTAGE, AND TYPE OF REVISED ANSWERS MADE BY 124 STUDENTS ON A MULTIPLE-CHOICE EXAMINATION IN GENERAL PSYCHOLOGY, ARRANGED ACCORDING TO GRADE EARNED[1]

Grade	Number of Students	Category 1: Right to Wrong		Category 2: Wrong to Right		Category 3: Wrong to Wrong		Average Number of Revisions per Student
		N	%	N	%	N	%	
A	9	8	18	26	58	11	24	5.0
B	30	40	18	142	64	39	18	7.4
C	47	87	23	176	47	108	29	7.9
D	30	68	26	106	40	88	34	8.7
F	8	21	28	26	35	27	36	9.3

[1] All percentages are listed to the nearest whole number. Therefore, adding percentages in the table horizontally will not always equal exactly 100.

Although the purpose of this section has been to study the general effect of revisions upon scores throughout the letter grade range rather than to determine how many grades may have changed by revisions, twenty papers were selected, sampling each sex in proportion to its incidence in the class, for comment. Of the twenty papers, fourteen were not affected in terms of letter grade by their revisions. The remaining six of the twenty gained a letter grade by their revisions.

SUMMARY AND CONCLUSIONS

For one hundred twenty-four students who took a multiple-choice final examination in General Psychology at the University of Hawaii, the answer sheets were examined in order to determine the effect upon test scores of changing initial answers. In general, the students gained significantly more than they lost in raw score, and many gained a higher letter grade by making such revisions. Only one student dropped one letter grade for

this reason. Women students made more revisions than did men, but women profited less thereby. Students in the D and F range profited less from their revisions than did A and B students though the former made more revisions.

Although the hypothesis that there is a 50–50 distribution of revisions between the right-to-wrong and the wrong-to-right categories has been rejected for this group at the one per cent level of confidence, a finding that is in agreement with results of previous studies, confirmation of the results should be sought from examination papers written by still other groups of students in different courses with various instructors before the results should be interpreted and applied generally. On the other hand, the results constitute a warning to teachers and others who advise students that first impressions are the best in reference to examination performance.

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A NOTE ON CERTAIN TEST SCORE RELATIONSHIPS AND THEIR IMPLICATIONS FOR RESEARCH IN TEACHER SELECTION

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The *Test of Practical Judgment* and *A Study of Sam Smith* are two tests which appear to have been neglected in the study of teacher selection and, nevertheless, appear to be of potential value in that area. With respect to the first test it seems reasonable to suppose that some teachers get into trouble because of a relative lack of practical judgment,[1] but there appears to be no serious investigation of the relationship between practical judgment and teaching success. The *Test of Practical Judgment* is the more interesting since Cardall reports an r of −.05 between practical judgment scores and intelligence scores.[2]

The second test, *A Study of Sam Smith*, is one which was developed to test the ability to diagnose and prescribe for deviant behavior. This is very close to knowledge of mental hygiene principles, which, in turn, is known to correlate with good teaching.[1] It seems reasonable to hypothesize that the ability to prescribe for deviant behavior would correlate more highly with good teaching than does knowledge of principles, since prescription is closer to what the teacher must do than is knowledge. This possibility is emphasized by the fact that *A Study of Sam Smith* scores are reported to correlate only .46 with scores on a test of knowledge of fact and principle in human development,[3] indicating a good deal of independence between the two.

It seemed desirable to check on the independence of the traits measured by these tests, however, before attempting to validate them as instruments useful in the selection of teachers. The correlations reported in Table 1 tend to do this. Since three scores are yielded by the *Study of Sam Smith*, they are treated separately. In Table 1 N is the number of subjects and r is the Pearson correlation coefficient. The subjects were college

students in educational psychology courses at Oklahoma A. and M. College in 1949.

Cardall's figure indicating the lack of relationship between practical judgment scores and intelligence is supported by these results. It appears, also, that the correlation between practical judgment and the ability to diagnose and prescribe for verbally presented deviant behavior is rather low. Another item of interest is the fact that the ability to diagnose and prescribe as measured by the *A Study of Sam Smith* test is only moderately correlated with intelligence.

TABLE 1.—SOME TEST SCORE RELATIONSHIPS

Tests Correlated	N	r
Practical Judgment Otis Gamma (Intelligence)	81	.10
Practical Judgment Sam Smith diagnosis score	89	.32
Practical Judgment Sam Smith remedial score	89	.30
Practical Judgment Sam Smith total score	89	.38
Otis Gamma Sam Smith diagnosis score	88	.32
Otis Gamma Sam Smith remedial score	88	.27
Otis Gamma Sam Smith total score	88	.49
Sam Smith diagnosis score Sam Smith remedial score	98	.67

In conclusion, insofar as these tests are concerned, it appears that practical judgment is fairly independent of diagnostic and prescriptive skills; that practical judgment is independent of intelligence; and that diagnostic and prescriptive skills are fairly independent of intelligence. Since it seems reasonable to suppose that practical judgment, diagnostic skills, and prescriptive skills are a part of the complex which makes a good teacher, it is suggested that the tests may be useful in choosing teachers, and, possibly, in selecting students for teacher-training.

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BOOK REVIEWS

E. H. Porter, Jr. *An Introduction to Therapeutic Counseling.* Boston: Houghton Mifflin Co., 1950, pp. 223.

A small scale liberation from rigid non-directive control is one way of perceiving this book. It includes material worthy of consideration because the issues and problems involved can be real and important in counseling. The title and some of the chapter captions suggest a textbook kind of treatment which is exactly what this book is not. General topics considered in the various chapters of the book include: Self-evaluative attitudes and psychological climate; typical problems in the beginning interview, in the middle and closing phases; special problems in counseling; and test material for use before and after the subject matter of the book is presented. Illustrative of the concrete nature of some of the issues considered are: What do you do when you want to record an interview; when a client hits a problem area which is also a problem area to you; when a client interrupts counseling with no further communication; when there is an interruption by phone calls or a knock on the door; or when the client wants to give you a gift? The book contains an appendix in which are found directions for scoring the tests included and reading sources. In the source references relating to different areas of relevance or application of therapeutic principles and procedures the frequent mention of directive contributions is conspicuous by its absence, but the author does not pretend to be neutral and instead tries to be open. Dr. Carl Rogers writes a forward in a somewhat paradoxical manner.

Porter, disciplined in non-directive orientation, appreciates the fact that to him the teaching of techniques should be taboo if he is to be consistent with his orientation. However, he manifests signs of being desirous of liberating himself from non-directive taboos. He has, accordingly, decided that people can be helped to learn how to interview and counsel in ways more specific than usually given or approved in non-directive teachings. His general attitude is that learners have to begin to learn somewhere and they can learn from other people's experience. Education as vicarious experience is an emphasis not in accord with non-directive orientation but is in accord with educational realities. Dependence on self-perception for therapeutic results rather than

any vicarious profiting of experience from others is more the implication of the non-directive outlook rigidly interpreted. Porter retains the basic framework for thinking that is his by the course of his training, but deviates in the sense that he thinks illustrative tests and related materials can be used to advantage as material to consider with which to improve the learning process in interviewing. In his treatment of the illustrations the author reveals a history of experience that has registered and is understood well enough by him to communicate fully to others in a simplified manner. In his multiple-choice tests he manifests the wisdom to give no answers that are right but does make it possible to learn the significance of each answer.

The reviewer has tried some of the pre-tests included in the book under the captions of "Aptness of Response" and "Perception of Client's Attitudes." When used on a class of seven graduate students in a course in clinical psychology in industry being prepared for practice in interviewing and counseling the results were satisfying from the teaching point of view. The answers given were classified as being interpretive, supportive, probing, and understanding. There were distinct differences between the most matured and experienced person and the most naïve person and enough differences to provoke discussion and consideration that makes an exercise of this kind obviously worth while in the teaching process.

All in all, the volume can be used to advantage for classroom teaching in interviewing particularly in a beginning course in counseling or interviewing. Considering that the author has been schooled in non-directive therapy he deserves commendation for rendering a service to teachers of counseling still open-minded enough to search and try to discover reality principles through differential counseling.

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W. BROWN AND H. C. GILHOUSEN. *College Psychology.* New York: Prentice-Hall, 1950, pp. 507.

College Psychology is an introductory textbook. The titles and order of the eighteen chapters are as follows: Introductory Survey; Learning; Conditioned-Reflex Learning; Trial-and-Error

Learning; Problem-Solving; Thinking; Memories and Thoughts; Economical Learning; Motivation; Motivation—Continued; Attention; Sensation and Perception; Sensation and Perception—Continued; Emotion; Maladjustment; Adjustment; Intelligence; Measuring Individuals.

The book appears to be well adapted to the first- or second-year student. It is written in excellent style. Technical terms are not avoided but are used sparingly. The student should not be overwhelmed with a burdensome number of new concepts, although it has ample content for a one-semester course. The topics treated are those that have become more or less standard in the introductory course. It appears to achieve the purposes of an introductory text quite satisfactorily.

The student will not get the idea from the book that there are different theoretical viewpoints in psychology. However, the instructor will recognize a bit of Tolman and a bit of Hull and the viewpoints of their associates. At certain critical points a synthesis of the two approaches appears to have been attempted, although this is not made an issue.

The book is quite attractive in appearance. The graphs and pictures are excellent.

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Pauline Park Wilson. *College Women Who Express Futility.* New York: Bureau of Publications, Teachers College, Columbia University, 1950, pp. 166.

The literature of human adjustment in specific areas is still far from complete, but Dr. Wilson's report on the life histories of fifty women-college graduates constitutes an addition which should be useful to educators and psychologists alike. Here are analyzed the cases of a group of active and able women, above average in intelligence, educational advantages, achievement, and socio-economic status, but all expressing some degree of futility ranging from a mild or moderate discontent to complete hopelessness and despair.

Study of the factors associated with futility in the fifty cases revealed the most common areas of experience in which these college women encountered frustration and defeat. Fifty per cent of the women expressed futility over relationships with their parents (example: "I have always been under the supervision of

my parents and probably always will be"). Fifty per cent indicated a sense of futility over their sex adjustment, and seventy-four per cent made statements regarding failure to achieve satisfactory personal fulfillment and a philosophy of life. Eighty per cent of the forty married women of the group expressed futility in relation to husband-wife conflicts and problems. Twenty-one other causes of expression of futility are listed, including finances, health, social status, and the care and training of children.

Through her study of the women's expressions of frustration, the investigator was able to identify twenty-three fairly specific life goals to which these people aspired. It should be noted that the goals were not described by the college women, but were recognized and isolated by the investigator over a long period of contacts and interviews with the fifty subjects. The major life goal most frequently identified was "to achieve success as a wife." Other important objectives were "to dominate, control, manage or manipulate people in the environment," "to be a good and successful mother," and "to cling to security."

Dr. Wilson's conclusions and implications, though briefly expressed, are singularly thought-provoking for counselors and teachers. She found that the essential reason why these fifty potentially capable women had arrived at a state of frustration and futility was their lack of the tools and understandings necessary to meet their life problems effectively. More specifically, they often failed to recognize impossible or unrealistic life goals, they possessed insufficient insight to modify their chosen goals in the face of repeated frustration, and they were unable to adapt and revise their techniques for attaining desired ends.

The implications of this investigation present a challenge to the educator by pointing up certain all-important needs, especially at the levels of the high-school student and the young adult. These needs, for education for husband-wife relationships, for parenthood, for better evaluation of self, for development of a well-developed philosophy of life, are not new to the curriculum-builders. But Dr. Wilson's report, although limited in scope and necessarily subjective and qualitative in method, calls attention to urgent problems in helping youth toward an improved way of life and adjustment.

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Studies in Reading. Volume II. London: University of London Press, 1950, pp. 113.

The first three of these four papers are theses for advanced degrees in education. The first is "Socio-Economic Status and Reading Ability—A Study in Infant Reading" by Violet M. McLaren. An attempt was made to determine the effect of the socio-economic status of the home on reading attainment of children from five to eight years old. The results of two teaching methods were also compared. Both are combinations of phonic and sentence methods. In method X, phonic training was distinct from story reading; in method Y, the two proceed simultaneously. Children taught by other methods were placed together in the control or Z group. Word recognition and comprehension were measured. Results include the following: No method of teaching was significantly superior to others used. Attainment in reading during early years is definitely affected by socio-economic status. It is probable, however, that intelligence rather than social status is the causal factor. Furthermore, school experience does not reduce discrepancies between social levels in reading attainment. The educational implications are obvious. The design in this experiment seems adequate and the conclusions justified by the findings. However, it is noteworthy that methods of teaching phonetics are not in line with approved American practice.

The second study, by Christian D. Taylor on "The Effect of Training on Reading Readiness," compared the achievement of Scottish pupils with that of American children of the same age who tend to begin school a year later than the English. The Scottish children obtained significantly higher scores than American children on both reading readiness tests and reading achievement tests. Stress is placed upon the fact that reading readiness can be affected by training and is not solely dependent upon maturation. Since there were only one hundred fourteen subjects in this study, final evaluation must await further investigation.

The third study by Doris C. Dunlop is concerned with "Children's Leisure-Reading Interests." The data obtained consisted of books issued at a representative Glasgow library. A sample of one hundred children was also interviewed. In general, the findings confirm the results obtained in previous

studies in Great Britain and America. As in any library study, the significance of the findings is somewhat limited.

The final section of the book lists "Some Reading Deficiencies and Their Remedies." Evidences of deficiency, the diagnosis and remedial suggestions are organized in tabular form. The material has value as a general guide in diagnostic and remedial practice. Work with any specific child must, of course, be highly individualized.

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N. H. PRONKO AND J. W. BOWLES, JR. (In collaboration with D. T. Herman, H. Hill, and J. Bucklaw, Jr.) *Empirical Foundations of Psychology*, New York: Rinehart and Co., Inc., 1951, pp. 464.

Recent years have seen the appearance of several fine books in psychology, reflecting the rapid advancement in the field. *Empirical Foundations of Psychology* should find a place among these books. It reports research, largely recent research, and sharpens issues, at various critical points in psychology.

The book appears to be designed primarily for supplementary reading for a general book, presumably for an elementary course in psychology. The reader encounters many articles and passages from books of other authors. These have suitable introductions and are accompanied by interpretative comments, with the result that the book presents a coherent story. More than half of the space is taken up with fresh material written by the authors. In this age of high specialization in psychology this book should serve to acquaint advanced students and professors with recent developments in the field in general. Chapter headings are: Introduction, Heredity and Psychology, The Reactional Biography, Biological Characteristics, Basic Patterns of Behavior, Social Behavior, Personality, Intelligence, Attention, Perception and Factors Which Affect It, Implicit or 'Thinking' Behaviors, Feelings, Emotion, Remembering, Learning, Interrelationships Between Physiology and Psychology.

The book is not of uniform excellence. The Chapters "Personality," "Intelligence," and "Feelings" appear to be somewhat weaker than the others. The chapter on learning will require a good deal of collateral reading or good teaching to be very meaningful to the beginning student. It also may be that some of the

sharpening of issues, distinctions between older and modern definitions, and the revolutions in psychological thinking will have greater interest to the mature reader than to the beginner.

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STANLEY L. PAYNE. *The Art of Asking Questions.* Princeton: Princeton University Press, 1915, pp. 249. $3.75.

The author devotes his entire volume to discussing the formulation of questions for public opinion surveys. Practical polling experience is used to indicate how to design and word questions, and a final check list of one hundred general principles is provided. The content appears thoroughly sound.

The style is catchy, and heavily influenced by Rudolf Flesch. One cannot help wondering whether the material could not easily be covered in twenty pages of less consumer-conscious writing. Nonetheless, the book is interesting and will tell the reader many things he forgot to consider in the last questionnaire he wrote. Unquestionably, a thorough reading of this book during the planning stages would bring about considerable improvement in many educational investigations.

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PAUL WITTY, Editor. *The Gifted Child.* Boston: D.C. Heath and Company, 1951, pp. 338.

This book is sponsored by the American Association for Gifted Children. Its preparation was directed by a committee consisting of Paul Witty, Chairman, Grace T. Hallock, Gertrude Hildreth, John Lentz, W. Carson Ryan, Ruth Strang, and Harvey Zorbaugh.

In the foreword the president of the Association states that the Association is "vitally concerned with enlarging our concept of ability and with the discovery of better ways of identifying the gifted in many different fields. And it is particularly interested in furthering educational opportunities for gifted children and youth." While the content of the book is limited chiefly to the intellectually gifted the authors of the various chapters show an interest in other kinds of talent. Indeed, one chapter is devoted to "Experiences With Children Talented in the Arts."

It does not reflect much progress in "better ways of identifying the gifted in many different fields." One short chapter describes the Westinghouse Science Talent Search. Brief space is given to art talent. The book as a whole seems to make a material contribution in the direction of the third stated aim of the Association, "furthering the educational opportunities for gifted children and youth."

Two substantial chapters are devoted to the work of Terman and Oden and of Leta Hollingworth. The chapter following these two "Some Observations of Highly Gifted Children," necessarily repeats a good deal of the material found in these two chapters. The chapter "Mental Hygiene of Gifted Children" presents appropriate data on adjustment problems incident to high intelligence. Other chapters are: "Progress in The Education of the Gifted," "Identifying Gifted Children," "The Teacher of Gifted Children," "Community Recognition of the Gifted," "Nature and Extent of Educational Provisions for the Gifted Pupil," "A High School of Science for Gifted Students," "Administrative Problems in Educating Gifted Children," "The Education of Gifted Children and Youth—Summary and Recommendations," "Annotated Bibliography on Gifted Children."

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ELIZABETH STADTLANDER. *Planning to Study Efficiently.* St. Louis: Educational Publishers, Inc., 1950, pp. 116.

This manual for beginning college students, is designed to foster organization of study procedures for effective learning. Throughout the student is stimulated to develop initiative and responsibility so that he may be motivated to organize and to use sound study procedures. Specific suggestions for planning and using a variety of these procedures are given: work schedules, concentration, taking lecture notes, textbook study, remembering, use of library, reviewing, writing an examination, etc. Ample references are listed at the end of each section.

The discussions are concise, interesting and clearly written. Many instructors will consider the material in this book too abbreviated to use as a text. Nevertheless, suggestions outlined are sound. Every college freshman who will read the material carefully and make a conscientious effort to follow the

suggestions should be able to improve his study habits. Unfortunately, provision is not made for application of suggestions under supervision. Instructors in how-to-study courses can, of course, introduce such supervision. Counselors who wish to prescribe some organized suggestions on study procedures will find the pamphlet invaluable. Its greatest use, however, may be in freshman orientation classes where a short section is devoted to study procedures.

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PAUL A. ZAHL, Editor. *Blindness, Modern Approaches to the Unseen Environment.* Princeton, New Jersey: Princeton University Press, 1950, pp. 576.

Blindness, Modern Approaches to the Unseen Environment is the most comprehensive volume on the subject, covering all phases of the problem of blindness, that has come to the attention of the reviewer. It is a compilation contributed to by thirty specialists selected by the editor, Dr. Zahl. Phases covered include History and Welfare, Education and Psychology, Vocational Considerations, the Military Blinded, Time-Tested Boons to the Blind, Explorations of New Technological Horizons, and Ophthalmological Factors. The objective of this contribution is to have available in one volume materials upon which can be evaluated all the work that is being done in the field at the present time for the purpose of spreading knowledge concerning blindness as well as serving as a background for further research. Originally, the editor was asked by the Committee on Sensory Devices of the National Research Council to prepare a statement describing certain war-time efforts to develop sensory aids to the blind. The editor, with the approval of the National Research Council, saw more usefulness in this more general volume and the present book is the consequence of this effort. The book covers the field very thoroughly in thirty-three chapters. It also includes twenty-one plate illustrations and an index.

Nine of the thirty contributors are themselves blind. Three of the contributors are psychologists. Dr. Karl Lashley has a chapter on "Psychological Problems in the Development of Instrumental Aids for the Blind." Samuel P. Hayes, as everyone in the field would expect, writes the chapter on "Measuring the Intelligence of the Blind." The chapter on "Personality

and Social Adjustment among the Blind" is written by Dr. Thomas D. Cutsforth who is listed in the chapter on blind in the professional fields as a successful consulting psychologist—which he is. The section on History and Welfare considers blindness in the United States, Great Britain, and Continental Europe, but it is a small Continental Europe including only Germany, Greece, Italy, and France. The U.S.S.R. and most of its satellites are conspicuous by their absence. In the section on Education and Psychology are included contributions about the preschool blind, special methods in teaching the blind as well as chapters already mentioned—intelligence and personality of the blind. The chapter on vocational considerations treats rehabilitation problems, blind in industry, the deaf-blind, blind and the professions, and laboratory work for the blind. The chapter on Military Blinded includes a consideration of the blinded veteran, the army blind, rehabilitation procedures in the Navy, Marine Corps, and the Coast Guard, and the service war-blinded in Great Britain. Time-tested boons considered include the talking book, the cane, the guide dog movement. The section on exploration of new technological devices includes a summary of the devices for aid to the blind, recording machines as a tool for the blind people, research and guidance aids, development of instrumental aids, research on reading machines, and electrical and magnetic production of 'phosphenes' and their possible application to problems of the blind.

As in most compilations, all the contributions are not even, some are excellent, some are weaker, and there is a fair amount of unnecessary overlapping that the editor made no attempt to eliminate. But, generally, the editor has succeeded in gathering materials which should serve the purpose intended; namely, to serve as a framework for further considerations of both practice and research. It is a volume that definitely should be useful to every research and field worker for the blind. Altogether it is a valuable study of an important social problem that psychologists, sociologists, and educators, as well as specialists in the field of the blind, can use to advantage.

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